SA/EPU/1/2/3/2

# SMOKELESS AIR

JOURNAL OF THE
NATIONAL SOCIETY FOR CLEAN AIR

No. 139 ⋆ AUTUMN 1966 ⋆ 3s.

*In this Issue*

The Economics of Air Pollution ★ Natural Gas and Clean Air
International News ★ Smoke Control in the North West and
the North East ★ The Alkali Inspectors' Report

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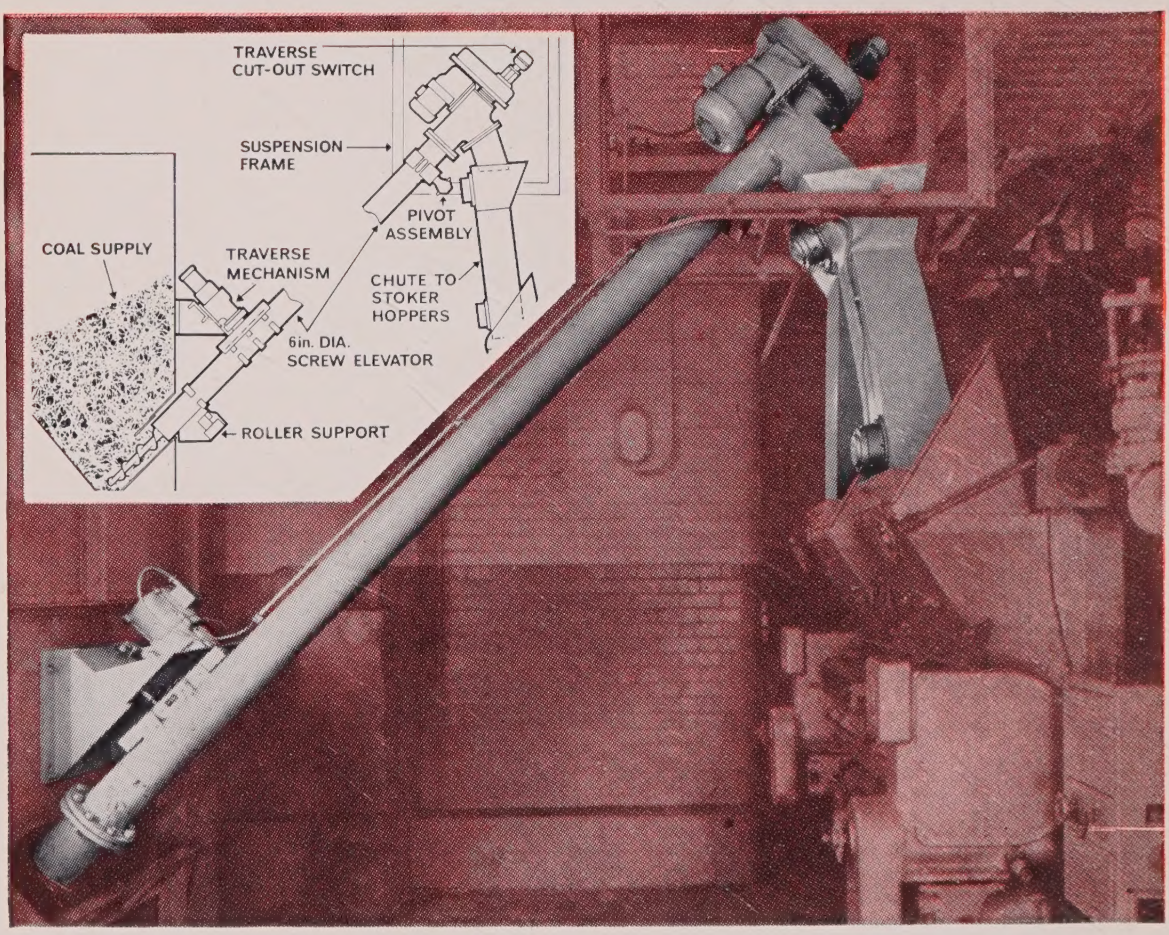

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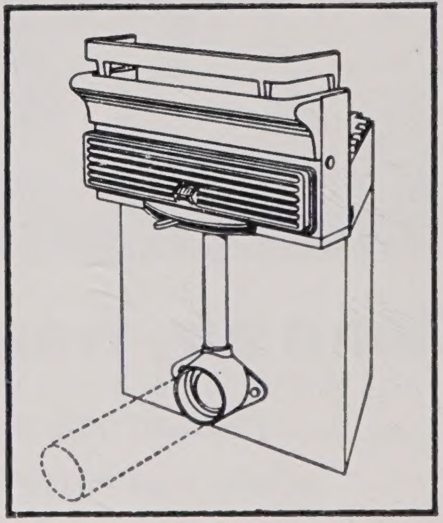

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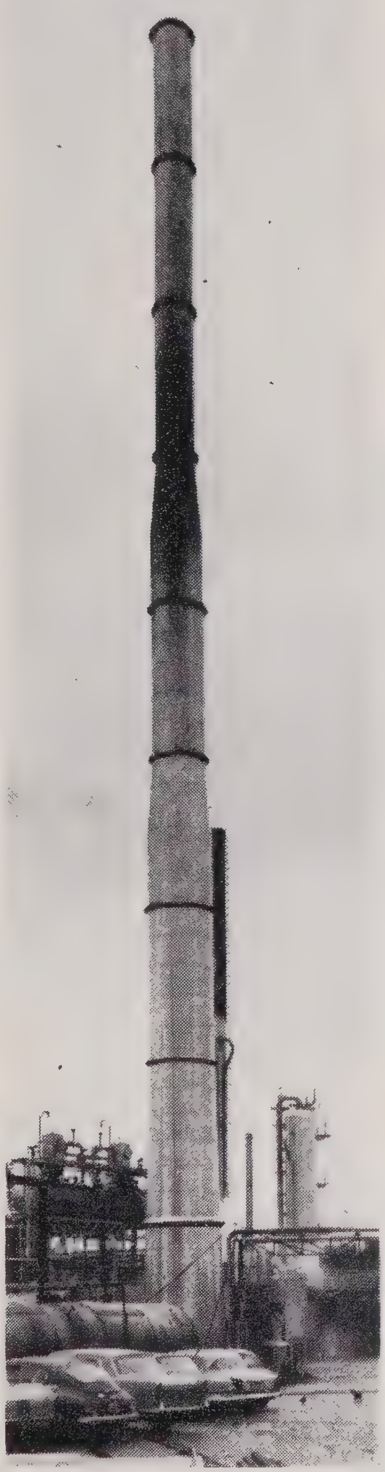

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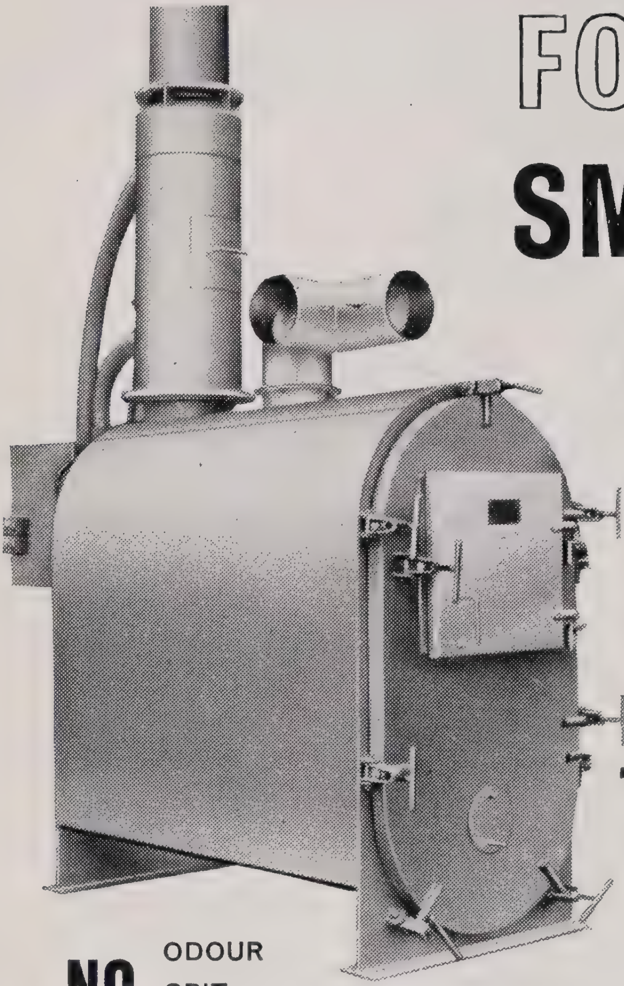

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# SMOKELESS AIR

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: CHAncery 5038 (Editorial and Advertising). Editor: Arnold Marsh; Asst. Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SMOKELESS AIR only, 12s. per annum, post free.

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*Ships, towers, domes, theatres and temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air.*

# SMOKELESS AIR

## Counting the Cost of Pollution

THE reviews, on a later page, of two new books focus attention on the economics of air pollution and its prevention. Mr. Alan R. Smith, looking in his report on the problem as it is in Britain, says that a great deal of work needs to be done on this aspect, and that only in the U.S.A. is it being discussed. This is confirmed by the second of the two books, which comes from that country. We agree with Mr. Smith that more discussion is needed here, and to prompt this it might first be asked why do we need more information on the economic cost of air pollution? Is it not sufficient to base the case for clean air on its effects on health and the amenities of life? Can the physical and psychological insult to body and mind be measured at all in economic terms?

Data on the cost of pollution has been needed and used for two purposes. First, factual but generalized information can be used to build up the case for action against air pollution as a whole. A recent example is of course the Beaver Committee's estimate of £250 m. as the annual cost of pollution to the nation. This figure, imprecise though it is, undoubtedly influenced public and Parliamentary opinion and helped the passage of the Clean Air Act.

Secondly—and this is the thought of Mr. Smith and of the American writers—is the need for estimates of the damage done by specific pollutants from specific sources, for the purpose of determining how far it is economically desirable to go with control measures. That is, for any pollutant or source, to determine the point at which control expenditure starts to exceed the economic benefit it achieves.

In certain cases this is undoubtedly a sound and useful approach. It is simple and straightforward if, for example, it is applied to the domestic problem in Britain: further evidence for the case for the complete abolition of smoke in built-up areas is hardly needed (except perhaps to define "built up areas" or "black areas"). But the more specific or localized pollution is, the more difficult it may be to isolate and measure the economic costs. How, for example, could one set about estimating the cost of the damage done by diesel vehicles on the roads? The economic cost of this familiar nuisance is in fact likely to be quite small or negligible, even if health costs are included. The case against diesel pollution surely must rest on amenity or aesthetic grounds. The main offence is in its nastiness, and that is a quality hard to express in economic terms.

Thus with two of the major pollutants in this country we either do not need, or cannot expect to obtain, any useful economic evidence.

The field where more economic information might be useful is perhaps in the special processes that come under the control of the Alkali Inspectorate. It is here that Mr. Smith, in chiding this country for having made no attempt to introduce economic thinking into air pollution control policy, adds—with a touch of reproof—that "the Alkali Inspectorate has no formula or systematic approach to the economics of air pollution control". But later on he refers to the highly successful effort of the Inspectorate and to the fact that our Alkai Act, and the way it is operated, is "the admiration and envy of air pollution control experts in other countries . . . Britain can regard itself as fortunate . . . "

From these two statements it might be inferred that better results will continue to be obtained if the economic costs continue to be ignored!

Such a conclusion would seem absurd to Professor Wolozin and his co-authors in the American book we review. But there may be a certain amount of truth in it. It would take too long to make the case here, but it could be attempted, that important though the economic aspects of air pollution may be, they are not the only "costs", and may be less important than the amenity and related *losses* that are suffered. The economic costs borne as a result of a malodorous fish and chip shop opening next door to your home might be nil, but the amenity loss might be heavy.

Another heretical thought occurs on reading about and trying to assimilate the information and reports relating to the elaborate and expanding (we nearly wrote escalating) programme of U.S. research, investigation, economic and public opinion inquiry, etc. May there not be a danger that a major economic cost of air pollution will be the cost of studying what to do about it?

This indeed seems to be in the mind of one of the contributors to the American symposium, Professor Ronald G. Ridker, who, after saying how much is more data on air pollution needed, adds: "Data collection is a very expensive process. In effect what is required to justify this expenditure is a benefit-cost analysis of the research activities themselves. Given the payoff probabilities and costs involved it is not at all certain that such an effort is warranted."

He goes on to say that he once had a conversation about this with a British air pollution administrator, who in effect said: "You Americans behave as if you have sufficient time and money to investigate a problem to death before you decide to act. In Britain we take note of a problem we do not like, take some action to correct the problem, and then do research after the fact to determine whether we were right."

## *Road Vehicle Report*

Mr. Alan Smith, whose monograph is discussed above and reviewed elsewhere in this issue, is a member of the Society and has been giving invaluable help to the Technical Committee. The Committee has been engaged in studying and preparing a report on air pollution from road vehicles, to be similar in character to its very successful report on *Sulphur Dioxide as an Air Pollutant*. With the International Congress keeping the Society's staff more than fully occupied, Mr. Smith (who had of course been studying the same subject for his own report) accepted an invitation to assist the Committee in this particular operation. The report is now in draft form, waiting final scrutiny by the Committee, but further progress has had to be deferred until the urgent work on the Congress is over.

Dr. J. S. G. Burnett, who has been Chairman of the Technical Committee for many years, has retired from that position and has been succeeded by Dr. Albert Parker. Only the members of the Committee can fully appreciate the great service given by Dr. Burnett in leading it during a term of office that has been marked by a great deal of difficult but successful work, more recently in relation to emissions from diesel vehicles. The Society's analyses of this problem have done a great deal to clarify this problem and its proposals for control have now been generally accepted and are leading to steady improvement.

## *Pre-Congress Notes*

These notes are being written in mid-August, weeks before the Congress is due to open, but they will be read only when that event is very close. So much that might be said could be badly out-of-date on publication. Anything, for instance, about the attendance we expect. At the time of writing the list of delegates is being watched with interest to see if it is going to top the Society's previous record at the Diamond Jubilee International Conference in 1959, when there were 1,251 delegates, including 180 from 30 overseas countries. To give the number of registrations at this moment of writing would be meaningless, but it is just reaching the 1,000 mark. We are leaving space for a stop-press insertion of figures (at 23 September) as follows:

| | |
|---|---|
| U.K. members and delegates | 906 |
| Overseas delegates .. .. | 292 |
| Total | 1,198 |

* * *

At one stage it was wondered whether this issue of *Smokeless Air* might not appear at all, or perhaps have to be postponed and merged with the Winter issue, because of the pressure of Congress work (accentuated by staffing problems that these days seem to afflict most London-based voluntary associations). As it is we hope that readers will be tolerant of any shortcomings of contents or quality that might be apparent. It is hoped that publication will be only a week after the scheduled date. The publication of the 1966-67 issue of the *Clean Air Year Book* has also been delayed for the same reasons.

* * *

At the time of writing the volume of papers to be presented, 92 in all, looks like running to near 400 pages. This is twice the size of the 1959 preprints, but the type size is larger and will be easier to read. The preparation and printing has taken longer than was anticipated, for a variety of reasons. Many papers are longer and have more illustrations than were stipulated and special efforts have had to be made to ensure that every paper has abstracts in the three Congress languages, English, French and German. The papers themselves are being printed in their original language, which in the majority of cases is English.

* * *

It would be difficult at this point to attempt to survey the papers and their contents, and unwise to try to anticipate the reviews to be given by the sessional rapporteurs. It may however be said that their quality is high, that the information they contain is in general interesting and valuable, and that the variety of aspects of air pollution and its prevention that they cover is remarkable.

We are particularly pleased with the six continental reports, all from representatives of member associations of the International Union. This is the first time that a world review of air pollution has been attempted and we are rather proud of the results, thanks to the efforts and co-operation of the authors. The reports are of course very different in their content because of the very different situations they have to describe, and such differences are in themselves most illuminating.

* * *

Although papers contributed in French and German are being printed in those languages, some language problems arose, as was expected, in the editing of papers submitted in not quite orthodox English. Another problem was whether to print American papers in American, English or in British English. The differences may be small but they stand out in a mixed volume such as, for instance, whether to print sulfur or sulphur. In general, we have kept the British style. For those "-ize" words that cause much trouble, we fortunately always follow the practice of the Oxford Dictionary, *The Times*, and the Americans themselves, so that the U.S. papers needed less correction than some of the British.

* * *

The Congress has been privileged in having generous hospitality offered for social occasions, in various ways, by the major fuel industries in Britain—the Gas Council, the Electricity Council, the National Coal Board, and Shell-Mex and B.P., Ltd. The other major oil company, Esso Petroleum Ltd., comes into the picture in a way that does not appear in the general programme, but is equally generous and appreciated. They are to be the hosts at a small luncheon party to be given the day before the Congress opens, to welcome the members of the Executive Committee of the International Union, the principal officers of their member associations, and a few representatives of our own and other governments associated with clean air. The luncheon will be followed by a meeting of the Executive Committee of the I.U. at which, among other business, it is hoped to make a decision on where the next International Congress is to be held, probably in 1969 or 1970. With, no doubt, tigers in their tanks, agreement on a choice should not be difficult.

* * *

On this last point, whichever association takes on the responsibility will have three or four years to plan the job, instead of the one year that has been available for the London Congress. Lucky people.

* * *

We have been glad to see that Germany will be well represented at the Congress, even though it does create awkward problems in print. Although "West Germany", we thought, was generally accepted, as in World Cup football and on many of the goods they sell us, we have been urged by our friends there to use the more correct "Federal Republic of Germany". We have also been told by high authority that we must refer to the other part of the country simply as "Germany", and never use another four-letter word in doing so. But we will still go on displaying the motto above our International Section heading—"Air Knows no Frontiers."

---

## R. W. REYNOLDS-DAVIES

We regret to have to record the death, suddenly on 5 July, of R. W. Reynolds-Davies, until recently Secretary of the Institute of Fuel. He had been Secretary since 1946, when he suceeded the Institute's first secretary, P. C. Pope, and he retired only on 30 April of this year. "R. D." had done an immense amount to build up the Institute to the position it now enjoys in the field of fuel and among its sister professional associations, and he was held in affection by all who knew him. His last year of office had been spent on a world tour on behalf of the Institute and one is glad that he was able to enjoy this, even though his retirement was cut so tragically short. Our sympathies are extended to his widow, who was a constant companion and support for him.

## Personal

Dr. A. C. Chamberlain is to succeed Mr. A. M. Wandless as Director of Scientific Control, National Coal Board, when the latter retired soon after the end of this year. Mr. Wandless has been very helpful to the Society's Technical Committee on many occasions, and we wish him well on his retirement. Dr. Chamberlain, as Chief Scientist of the Board's Scottish Division, is well-known to the Society's members in Scotland.

Dr. R. Jackson has been appointed Secretary of the Institute of Fuel in succession to R. W. Reynolds-Davies, whose death shortly after retirement is noticed elsewhere in this issue. Dr. Jackson was formerly at Sheffield, associated with the late Dr. Sargeant, and more recently was with B.C.U.R.A.

# *New M. H. L. G. Circular*

## Grant Arrangements Revised

The Minister of Housing and Local Government has issued to local authorities a new Circular (25/66) in which the new grant arrangements explained in Circular 51/65 have been amended. The latter circular was described in the Autumn, 1965, issue of this journal, when the cost lists for conversions with various appliances was reprinted in full.

The changes made in the new circular are to take into account new appliances, increases in costs and developments in the testing of electric storage heaters. Details of these, including a new list of cost limits for appliances, and advice on other points relating to grant, are set out in an appendix. The new cost list is not reprinted here, but for easier reference, in the new 1966-67 edition of the Society's *Clean Air Year Book*.

The excellent little booklet published by the Ministry "Smoke Control Areas: Your Questions Answered", is now out of date and a revised version is attached as an appendix to the new circular. It is not being published separately for distribution to the public, but is intended as a guide for local authorities who may be producing their own information booklets.

### New Exempted Appliance

With the circular is enclosed a new Smoke Control Areas (Exempted Fireplaces) Order (S.I., 1966 No. 217). Subject to the usual maintenance and operation conditions, this exempts from the provisions of section 11 of the Clean Air Act, 1956. the fireplace known as the Hounsell Sawdust Burning Stove, manufactured by John Hounsell (Engineers) Ltd. No fuel shall be used other than wood waste in clean condition.

### Suspension Orders

Other Statutory Instruments recently issued are two (for Mansfield and Newton-le-Willows) suspending the operation of smoke control orders made in 1962. The suspensions, dated 16 and 28 June respectively, suspend the orders until 30 September 1966.

### Scottish Circular

The Scottish Development Department has issued to local authorities in Scotland a circular (S.D.D. 19/1966) which makes "Multiheat" an authorized fuel, and also makes applicable to Scotland the Exempted Fireplaces order referred to above.

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## IN PARLIAMENT

**Mr. John Hall** asked the Minister of Housing and Local Government what action he proposes to take following the statement made in the annual report of the Alkali Inspector for England and Wales and Northern Ireland that there is a prospect of steadily worsening air pollution in Great Britain and that the prevention of pollution by sulphur dioxide, grit and dust and motor fumes should be given the highest priority.

**Mr. Mellish:** The standards for control of industrial emissions are being constantly improved. Widespread research into the hitherto intractable problem of preventing sulphur dioxide emissions continues here and abroad. In the meantime my right hon. Friend will continue to reply on the dispersion of industrial emissions from tall chimneys to avoid undesirable concentrations near the ground. He will shortly be issuing guidance for local authorities and industry on the control of grit and dust, and he is urging local authorities to press on with domestic smoke control.

Pollution by motor fumes is primarily a matter for his right hon. Friend the Minister of Transport and he is in close touch with her about it. (12 July, 1966).

**Exhaust Fumes (Control)**

**Mrs. Joyce Butler** asked the Minister of Transport if she will now seek to require car manufacturers to fit anti-exhaust pollution devices to all new models.

**Mr. Swingler:** Investigations in Europe and in this country have not yet reached a stage at which we can decide the extent and nature of any further control of car exhaust fumes. (3 August, 1966).

**Air Pollution Bill**

Mr. Robert Edwards, M.P., who sought to bring in a Bill on air pollution last year has again given notice that on Tuesday, 22 November he will again seek to introduce a Bill to make further provisions against the pollution of the air; to confer further powers upon local authorities in this respect; to amend the law with regard to diesel and other exhaust fumes; and for purposes connected therewith.

## INTERNATIONAL CLEAN AIR EXHIBITION

To be held in conjunction with the International Clean Air Congress, the Clean Air Exhibition will occupy 19,000 square feet of space in the New Horticultural Hall and will demonstrate the means that are available in this country and overseas for preventing air pollution in the home and in industry. The subjects covered by the Exhibition will include industrial smoke prevention and fuel efficiency; industrial dust, grit, fume and gases control; various methods of domestic and other space heating; road vehicle pollution control, research, and the measurement of pollution.

**Fumeless Vehicle**

A possible solution to the problem of cars in cities is the battery electric car. One typical of those being developed for short range journeys, will be shown at the Exhibition by the Electricity Council (EDA Division), as an example of future town centre road transport without pollution.

A firm, Beckman Instruments Ltd., whose parent company is located in Los Angeles, California, will display for the first time in the U.K. instruments for analysing various automobile exhaust gases. These include a new analyser used for detecting oxides of nitrogen from auto exhausts and an analyser measuring total hydrocarbon content in the atmosphere.

**Domestic**

Among interesting new developments in clean air home heating is the "Trident", a new type of gas central heating unit made by Ideal Standard Ltd. This is the first ever gas-fired unit featuring a room heater, back boiler, and able to heat up to five radiators plus constant hot water.

"Fantom" forced draught open fire, specially designed for smokeless zones will be exhibited by Baxi Ltd. Burning any solid fuel, the Fantom has a built-in electricaly driven fan concealed in the fire front.

New Heatmaster G.4400, a gas fired small bore unit designed to provide central heating and domestic hot water for three to four bedroomed houses, will be shown by Radiation Central Heating Ltd.

**Research**

There will be for the first time on display a new air pollution sampling unit for use in districts with no mains electricity. Designed in conjunction with the Ministry of Technology, the instrument when powered by a special battery can run for up to nine days without attention (Charles Austen Pumps, Ltd.).

**International Exhibits**

The Federal Republic of Germany is staging a government sponsored stand which will survey the various efforts being undertaken by Federal and Land agencies, industry, and the VDI Clean Air Commission, to solve air pollution problems in their country.

Head Wrightson & Co. Ltd. of Thornaby-on-Tees, in conjunction with its associated companies in Austrialia, Japan, Belgium, Italy, and the U.S.A. will have an international exhibit based on the theme of industrial gas cleaning throughout the world.

*"Air Knows no Frontiers"*

# *INTERNATIONAL SECTION*

*Scandinavia*

## FOUR-NATION REPORT

The Scandinavian Council for Applied Research (Ornevej 30, Copenhagen NV, Denmark) has published an English language version of a report entitled *Survey of Air Pollution Control and Research in the Scandinavian Countries.*

The report covers the situation in the countries of Denmark, Finland, Norway and Sweden. It outlines the organization and legislation that exists in each of the countries, and gives an account of research surveys and investigations being carried out. There is also a useful bibliography of reports and papers published in the Scandinavian countries on air pollution subjects.

Norway is said to be the pace-setter for legislation in the realm of good neighbourship. From 1961 the "Good Neighbourship Act" has been enforced. This law makes it compulsory for such plants and factories as cause air pollution to submit applications for concessions to the authorities, and a special government agency, the Smoke Control Council, was appointed for this purpose. The law lays down stricter rules to be followed when a decision has to be made as to whether a plant, which infringes the law, is to be stopped or forced to undergo certain changes, or whether it shall be permitted to continue its operations provided a payment is made.

In accordance with what is customary in other Scandinavian countries, Norway also has rules and regulations concerning this problem in the Public Health Act, the Building and Construction Act, and the Motor Vehicle Act. In the other Scandinavian countries legislation consists of a number of specific statutes, and sections of the legislation in related fields cater to these problems; such as laws within public health, industrial safety, building and construction, traffic and good neighbourship. Legislation more directly aimed at the prevention of air pollution is under way in Sweden.

*The Netherlands*

## RESEARCH ON POLLUTION AND HEALTH

from

**Professor Dr. J. W. Tesch**

(*Organization for Health Research, TNO*)

Since air pollution became front page news in this country, as in others, much has been written and spoken about the bad influence of the total pollution. It is common opinion now, that with increasing industrialization and urbanization, air pollution should be diminished. It is typical of the image of air pollution in the eyes of the general public in the Netherlands that from a survey carried out on behalf of the Society for Tuberculosis Control it appeared that air and water pollution was very high on the list of potential dangers for health. A sample of the population was asked what they considered to be the main dangers for their health. It appeared that 44 per cent marked air pollution as the most important danger; 9 per cent traffic accidents; 13 per cent smoking and overeating; and only 12 per cent certain diseases (of which tuberculosis only 1 per cent). This certainly gives a wrong picture but it gives a good impression of what the general public thinks about these problems.

### Thesis on Air Pollution

Now recently for the first time a thesis to obtain the degree of Dr.Med. Sc., on the subject air pollution, was presented to the Amsterdam University. The author was Dr. Biersteker, who for three years has been attached to the Rotterdam Health Service in charge of scientific research. He has carefully analysed data (mortality and morbidity) during certain fog periods and also collected data on lung cancer and chronic non-specific lung disease (CNSLD) over certain periods of the year in Rotterdam, comparing them with other areas and with the overall national data. On the basis of five hypothetical statements he analysed the available data.

Concerning the influence of certain atmospheric conditions (temperature inversion) where the usual parameters of air pollution ($SO_2$—smoke) rise considerably, there is, when using moving 15 days averages, a slight rise in mortality and morbidity (measured by absenteeism and hospital admissions). Such atmospheric conditions are very rare. The two episodes studied (*i.e.*, January 1959 and December 1962) coincide with the last episodes in London, where a much greater influence was found. As a sequel to this conclusion the relationship between the concentrations of $SO_2$ and smoke indoors and outdoors was studied; the average living-room contained only 20 per cent of the $SO_2$ but 80 per cent of the smoke concentrations recorded outside.

### Effect of Low Wind

The author found that on winter days, with a wind velocity of less than 1 m/sec., there was not only in Rotterdam but also in the country as a whole a number of excess deaths. The effect of the low wind velocity might be explained by other factors than $SO_2$ and smoke, such as down-draught of bad chimneys (carbon monoxide levels). This leads the author to say: "Due to the interference of this indoor factor, it may be difficult to use daily fluctuations of mortality".

As to chronic influence the author comes, after analysis of many data, to the conclusion that the rural/urban gradient in the Netherlands of bronchial cancer can be explained by differences in smoking habits which by the way, are more and more levelling out over the country as a whole.

As to CNSLD mortality Biersteker remarks: "Only with finer tools (questionnaires, lung function tests) it will be possible to discriminate between the factors which play a role in CNSLD morbidity and eventually mortality".

On CNSLD in general it should be emphasized that the mortality from these diseases in the Netherlands has always been much lower than in England.

### New Studies

Recently, studies on the prevalence of signs and symptoms of CNSLD were initiated. In three communities, one small, compact town, one rural community, and one rapidly growing industrialized town, samples of the male population (in one case also females) of the 40—65 age group were examined with a questionnaire, lung function tests, allergy tests. In all three communities a substantial section of the sample was found to have positive history and signs of CNSLD.

It is planned to continue such examinations in other communities also with follow-up studies.

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## Netherlands Conference

A successful international health congress, organized by the Royal Society of Health, was held at the Hague in September. It included a session on air pollution, presided over by Dr. Albert Parker, with three papers read and discussed on the situation in the Netherlands, Belgium and France.

We hope to give a full report in our next issue.

*U.S.A.*

# NATIONAL CONFERENCE CALLED

The Public Health Service of the U.S. Department of Health, Education, and Welfare announces the holding of a national conference on air pollution in Washington, D.C. on 12 to 14 December, 1966. It is sponsored by the Department and participation will be open to the public.

There will be plenary sessions on Monday 12 December, eight panel sessions, held simultaneously on the following day, and two plenary sessions on the Wednesday. There will be a banquet on the evening of 13 December.

The panel sessions will consider the following themes: motor vehicles; heat and power generation; industrial operations; solid waste disposal; developing, establishing and improving State air pollution control programmes; developing, establishing and improving local and regional air pollution control programmes; improving the Federal air pollution programme, and "How do we pay for air pollution abatement?"

Further information may be obtained by writing to: Executive Secretary, National Conference on Air Pollution, U.S. Dept. of Health, Education and Welfare, Public Health Service, Washington D.C., 20201

### San Francisco Congress

The 59th annual meeting of the Air Pollution Control Association of America was held in San Francisco from 20 to 24 June, 1966. It was attended by some 300 experts from the U.S. and overseas, and 127 papers were listed for discussion. The opening, or keynote, speaker was Governor Edmund G. Brown of California. At the time of going to press we have not received copies for reporting of the papers presented.

### Dr. Louis McCabe

The name of Dr. McCabe will be known to many air pollution workers in Britain and other parts of the world as one of the leaders in the development of air pollution control in the United States. He is to attend the forthcoming London Congress and is joint author of one of the papers. He was honoured at the San Francisco meeting as a recipient of the Frank A. Chambers Award of the Association. The citation states that "This award is granted by the Association for outstanding achievement in the control of air pollution, to recognize a specific act which is considered to be a major contribution to the science of air pollution control. Louis McCabe has long been a recognized leader in air pollution control. His scientific and engineering knowledge and his administrative skill have contributed in an outstanding war to air pollution control over many years and in a variety of positions. The specific contribution for which this award is presented is his leadership in the establishment of the Los Angeles County Air Pollution Control District during the period 1948-1950 . . . "

Congratulations, Dr. McCabe!

### Prospects for Non-Polluting Vehicles

An engineering report on potential new pollution-free power sources for motor vehicles has been submitted (5 May 1966) to the State Motor Vehicles Pollution Control Board of California. Summed up, the long-range outlook is said to be good, but "it's like a pot of gold at the end of the rainbow".

The staff report said that, although research is going forward in many fields, the best hope for auto smog control still lies with controlled gasoline engines.

According to the report, the automobile industry already has 60 years' experience with the present piston engine and has come a long way in the development of crankcase and exhaust control systems.

The report stated that conventional

piston engines would not be replaced for some time, but that "there are causes for considerable optimism regarding emissions of the present engine modified for exhaust control."

This was confirmed by Oscar Burlin of Solar, San Diego, who said that the gas turbine engine is valuable as a contaminant control, but not yet ready for the consumer market.

Two other representatives from the Electric Storage Battery Co. of Philadelphia, Mac McMullan and James Norberg, said electric-powered cars are practical for short-haul trips, but not for replacement of the entire car population at this time.

A table accompanying the engineering report compared various types of motive power. Highest rating was given to the present gasoline engine, both controlled and uncontrolled. Gas turbine and fuel injection were next in order, with the least likely prospect being the atomic steam reactor. Factors of cost, durability, fuel consumption and performance were considered.

In commenting on the report, William E. Nissen, MVPCB chairman, said, "If the strides made during the last few years are indicative, it is not unlikely that the internal combustion engine, as we know it today, will be refined in several decades to the extent that it may be a clean source of power for the motor vehicle."

At the same time, S. Smith Griswold, former Los Angeles Air Pollution Control Officer and now with the federal Division of Air Pollution, U.S. Public Health Service, warned the MVPCB that its responsibilities were "far from over."

He told Board members that the federal government will see that motor vehicles meet federal emission standards, starting with 1968 models, but that individual States will have to see that the cars continue to comply.

He said that the U.S. would be happy to work with California on tighter emission standards and their use in various engine sizes.

*Japan*

# POLLUTION GROWTH IN TOKYO

The April, 1966, issue of the English language *Tokyo Municipal News* carries a feature about the noxious air pollution from which the city is increasingly suffering. A list is given of installations emitting smoke in Tokyo. There is a total of 15,377 installations, the principal categories of which are boilers (9,288), melting furnaces (1,291) metal superheating furnaces (1,271), hot blast furnaces (611) and incinerators (859).

The emissions from motor vehicles is causing alarm. In addition to over a million vehicles registered in Tokyo there is an influx of vehicles from outside, bringing to the total volume of traffic up to two or three millions a day. Measurements of pollution are now being systematically carried out, and there are laws for controlling the emissions of smoke. But it is feared that the situation is worsening and that more stringent controls will have to be introduced.

*German F. R.*

### DM. 1,000m. for Clean Air

According to the present state of planning at metallurgical plants, nearly 90 per cent of the plants are expected to operate dust-free by the beginning of 1968. This and other information was furnished by the German Institute of Industry. In the chemical industry, the smoke, soot, and dust problems in the main are solved. In the cement industry, the absolute amount of dust discharged was only about a third of the 1950 rate though production has trebled in the past 15 years; for dedusting units alone, this branch of industry has expended DM 350 million. The capital value of the flue-gas cleaning equipment installed in German F.R. power plants amounts of approximately DM 600 million. Future expenditure by the industry, only for operation of already existing facilities and equipment for air cleaning, have been estimated at approximately DM

*Vehicle Fumes and Road Dust on a road in Japan. Photograph from Tokyo Municipal News*

500 million per annum. New plants will have to be so designed as to operate dust-free from the start. *V.D.I. Nachrichten, 1 June, 1966.*

*New Zealand*

### Clean Air Society Formed

According to a report in the *Christchurch Press*, a Clean Air Society for Christchurch was formed at a meeting held in May. One speaker estimated that the damage due to pollution cost the city £1m. per year. The Society intends to press for the publication of an air pollution report prepared by the Regional Planning Authority, for the production of smokeless fuels, and for the appointment of a smoke or chemical inspector for Christchurch.

### Brazil

A Clean Air Society for Brazil has been formed, with headquarters in Sao Paulo. It is the "Associacao Brasileira de Prevencao a Poluicao do Ar". The Address is Rua Catumbi, 318° -6 -Z.P.7, Sao Paulo. The President is Eng° Durval J. Canella.

### Air Pollution and Infant Mortality

The journal *The Medical Officer*, in its issue of 22 July, discusses two reports on infant mortality, and comments on the regional differences that are revealed. After standardization to take account of the different age distribution of mothers in each region, the North presents the highest ratios of stillbirths and post-neonatal deaths and Wales for neonatal deaths; in each of these cases the regional rates are about 25 per cent higher than the national rates. The editorial concludes that "We cannot help suspecting that of all possible factors which influence the continuance of the unfavourable rates in the North and in Wales by comparison with other regions that of implementation of the Clean Air Act may still be the most obvious. The other main factor may be assumed to be housing and the greater concentration of Social Classes I and II in the regions with better rates, but here one is entering into the more speculative realm of receptivity to health education."

**Reviews**

# The Economics of Air Pollution

**Air Pollution, by Alan R. Smith. Society of Chemical Industry Monograph No. 22. pp. 203. Published by the Society at 21 Belgrave Square, London, S.W.1. £3.**

**The Economics of Air Pollution. Edited by Harold Wolozin. pp. 318. W. W. Norton & Co. Inc., New York. $2.95.**

These two volumes can be reviewed together because the most important parts of each are closely linked and in fact have much in common in their approach to the economics of air pollution and in their conclusions. They are both, in effect, exercises in new, and in all probability better, ways of thinking about and evaluating the cost of air pollution. The S.C.I. monograph is of course closer to us, and must be given fuller consideration.

The monograph is a useful contribution to the study of air pollution from a professional body whose interest in air pollution we are glad to welcome. It is the outcome of a proposal made by Lord Fleck when President of the Society and of a subsequent small committee which proposed the making of a "technological and economical assessment of how much air pollution causes harm to the community by the cost of ill health to individuals and by the corrosion of materials". Mr. Alan R. Smith, who had recently retired from a senior post in the chemical industry, was invited to undertake the study, which he began in 1964 and completed early in 1966.

The terms of reference quoted above are perhaps open to criticism for being limited to cost, and to the cost of two only of the many consequences of air pollution. Fortunately Mr. Smith has surveyed the problem on a wider field and has produced a report of considerable interest. The first part is a survey of the situation, with chapters on the Alkali Act, the operation of the Clean Air Act, road vehicles, and sulphur dioxide. Much of this is of necessity straight reporting of known facts, but it is useful to have them set out in the ordered and lucid way that marks the whole report. The chapter on the processes controlled under the Alkali Act is particularly helpful for reference, and the author's conclusions to each group of processes reviewed are succinct and sensible.

The domestic problem and road vehicle emissions are also fully and clearly described, and the chapter on sulphur dioxide is, and is acknowledged to be, based on the NSCA report *Sulphur Dioxide as an Air Pollutant.*

The motive for the report was however the economic aspects, and it is here in Part VI, and in Part VIII, on "Conclusions" that the real value of the monograph lies. (Part VII, incidentally, is an excellent survey of air pollution control in the U.S.A., which was visited by Mr. Smith for the purpose). Parts VI and VIII will be discussed in more detail.

### The Economic and Social Aspects

Mr. Smith's approach is outlined by reference to the two value judgments involving economic facets of the problem. The first of these asks, in connection with any proposal for air pollution control, whether or not the cost of remedial measures is justified by the reduction in the economic damage likely to follow their use.

"The economic approach", continues the author, "is also concerned with the distribution of the financial burden of air pollution control. In the long term, of course, individuals meet the cost, but in the short term it can fall on individuals, on local authorities, on industrial organizations, and on the central government. This short-term financing can give rise to important issues of social equity."

He goes on:

"Stated in such terms, the economic approach to air pollution may seem comparatively straightforward. It is, in fact, highly complex, and it is almost certainly true that it is in the economic aspect of air pollution on which least work has so far been done, on which most confusion seems to exist, and on which a great deal of work needs to be done".

The literature on this, it is argued, is scanty, and only in the U.S.A. is an attempt being made to discuss it—a point confirmed by the review of the American work that follows. A survey of attempts to estimate the economic costs of air pollution is given, beginning with the Pittsburgh survey of 1913, and ending with the Beaver Committee's investigation in 1954. Mention is made of the promising inquiry started by the National Smoke Abatement Society in 1939 and suspended on the outbreak of war. (What is overlooked is that some significant information was obtained before the inquiry ended, derived from the comparison of certain costs borne by comparable establishments in clean and in smoky areas. For example, a well-known firm of multiple shops estimated that its costs for cleaning and decorating in the two types of area were in the ratio of 4:7, and for window cleaning in one of the principal banks in the ratio 2:3.)

Mr. Smith continues by discussing the use of economic data and explains the analysis attempted by the Division of Air Pollution in the United States Department of Health, Education, and Welfare, including the economic technique known as benefit-cost analysis—balancing the cost of control against the benefits, or the savings due to no control against the cost of the damage done. This method is used in other fields but with air pollution it is found to be too complex and too uncertain in relation to the data that is available. Nevertheless simpler economic techniques may be used:

"The function of the technical aspect of air pollution control is, through research and engineering, to find technical solutions to air pollution problems. It is the function of the economic approach to help determine the extent to which the solution should be applied, in the light of their cost related to the damage caused by the pollution they are designed to control. It can also give pointers to the directions research should take."

Mr. Smith continues:

"In the United Kingdom no attempt seems to have been made so far to introduce economic thinking into air pollution control policy as a whole. Moreover, the Alkali Inspectorate has no formula or systematic approach to the economics of air pollution control. Decisions are usually taken in partnership with industrial representatives, often following a joint study of the problem and the use of pilot-scale or full-scale trials. The final decision is made by the Chief Inspectors and they use their experience in weighing up the various factors. There can be no question of allowing a public health hazard for the sake of the cost. Should prevention be considered to be too costly, then full use must be made of dispersion to render the emission harmless and inoffensive. It does sometimes happen that a works will abandon a registerable process because the owners consider the requirements of the Inspectorate to be too great for their scale of operations. The Inspectorate usually manages to get a 'guinea pig' to show the industry the way in case of doubt.

Thus the Alkali Inspectorate works essentially on the basis of practical experience . . . "

The question of "social cost", a rather complex economic concept, where the market equilibrium between the private costs of production and of consumption are distorted by some costs being evaded and shifted elsewhere—to be borne by the community. Air pollution is cited as a classical example of this, and reference is made to the address by the late Hugh Gaitskell to the NSCA, in which this approach was discussed.

This is an aspect of air pollution that has been ignored in this country, and Mr. Smith considers that it should "be brought into the arena of debate, and its possibilities and limitations explored, as they are being in the U.S.A.

### Industrial Pollution

Mr. Smith's conclusions, which are those of an economist and statistician coming to the problem with a fresh and unprejudiced mind, deserve wider publicity than they may receive in a report that costs £3 a copy.

On the industrial side he considers that with further improvements that can be expected, smoke is no longer a major contributor to air pollution. "All that is required is continued effective supervision and the application of the industrial smoke provisions of the Clean Air Act". Dust and grit emissions are being reduced and again "the provisions of the Clean Air Act seem adequate to meet the needs of the case". On sulphur dioxide reference is again made to the six ways of securing improvements advanced by the NSCA, and "further consideration might well be given to limiting or prohibiting the use of sulphur-containing fuels in areas of high population density at times when temperature inversion and fog are likely".

The control of the pollution that is the concern of the Alkali Inspectorate is discussed at some length, and the following passage may be quoted in full:

"The system of air pollution control operated in this country for over a hundred years under the Alkali Act is unique. No other country has anything quite like it and it is in fact the admiration and envy of air pollution control experts in other countries. In particular, they envy the long tradition and fruitful outcome of close co-operation between industry and the Inspectorate. They are surprised at the level of self-discipline which has been accepted by British industry and they feel that such a system would not work well in their own countries. The general feeling in other countries is that their control organizations will have to carry out at considerable cost the research and investigation work which is done in this country for the Inspectorate. In consequence, they expect that their control organizations will have to be considerably larger. This trend is already visible in the United States."

"It would be difficult indeed to build a system such as the Alkali Inspectorate in a matter of a few years and Britain can regard itself as being both fortunate and in advance of other countries in this particular and very important aspect of air pollution control."

### The Domestic Aspect

One would like to quote the conclusions on domestic pollution verbatim, especially as they include a strong criticism of the rate at which progress is being made and of the local authorities that are failing in their responsibility:

"The main conclusion to be drawn from this analysis of the position is that, if the clean air campaign is to be taken seriously in this country, a major attack must now be made on domestic air pollution. While efforts to reduce industrial air pollution should be continued along the lines which are producing very satisfactory results, pressure should now be exerted on the laggard local authorities in the black areas to establish smoke control areas far more rapidly than in the past.

"Without this, the extensive and costly efforts being made by industry will fail in their purpose. The contribution to clean air made by industry and by domestic premises respectively has become badly out of balance and the balance ought to be redressed."

Some of the proposals made will not be welcomed by all, as for example:

"The National Coal Board and other producers of solid smokeless fuels are undoubtedly to be commended for their efforts in providing solid smokeless fuels in new forms and larger quantities. In the long run, however, the use of such fuels should be discouraged, since they give rise to sulphur dioxide emission."

But even more controversial will be

the paragraph that follows on the grants made for the conversion of appliances in smoke control areas:

"It is open to argument that this system of subsidy to certain householders out of taxes and rates is both economically unsound and socially inequitable, for three reasons. First, it has already been shown that, as the late Mr. Hugh Gaitskell suggested, the damage caused by air pollution is a good example of what economists call a social cost, i.e., a cost which is evaded by the person causing the damage and left for the community as a whole to bear. In the case of industrial air pollution, the cost of the remedial measures designed to eliminate or reduce the causes of the damage is placed on industrial organizations; there is very good reason why the same principle should be followed in the case of domestic air pollution. Second, the trend to more sophisticated fuels shows that a steadily increasing proportion of householders are, at their own expense, adopting systems of domestic heating which avoid emissions of both smoke and sulphur dioxide. When such householders find themselves included in a smoke control area they get no grant towards the expenditure they have incurred, but they have to contribute through rates and taxes to other householders less enlightened or less public-spirited than themselves. Third the system of subsidies is cumbersome, involved and costly in terms of administration.

These reasons are sufficiently strong to suggest that the present grant system needs to be reconsidered. To a community, nearly all sections of which spend very considerable sums of money on alcohol, tobacco, betting and amusement, the capital cost of meeting the requirements of a smoke control area is comparatively small and could well be borne by the householders involved.

"Some cases of short-term hardship would no doubt result from the cancellation of the present subsidy system. These could be met in one of two ways: by grants in special cases and by repayable loans made by local authorities in others."

We have given an extended review of this monograph both because it deserves it and because it should be brought to the notice of those who will not be able to purchase it. An abridged, paper-back edition, selling at a few shillings, would be most useful.

## THE AMERICAN APPROACH

*The Economics of Air Pollution* is a paper-back, but it is not abridged. It is a substantial volume containing the papers presented at a symposium at the American University (Washington, D.C.) The symposium was supported by the Federal Public Health Service, and is an example of the economic study of air pollution urged by Mr. Smith in his report. There are ten papers, plus a Staff Report on Pollution to the Committee on Public Works, U.S. Senate, plus appendices that give in full the U.S. clean Air Act and its 1965 amendment.

The scope of the book can best be indicated by listing the titles of the papers it contains. After a preface, foreword and introduction, these are:

Air Pollution—General Background and Some Economic Aspects, by Allen V. Kneese.
Economic Incentives in Air Pollution Control, by Edwin S. Mills.
Risks versus Costs in Environmental Health, by Leslie A. Chambers.
The Structuring of Atmospheric Pollution Control Systems, by Thomas D. Crocker.
Strategies for Measuring the Cost of Air Pollution, by Ronald G. Ridker.
The Use of Government Statistics in Air Pollution Control, by Edward T. Crowder.
The Use of Consumer-Expenditure Data in Air Pollution Control, by Helen H. Lamale.
Air Pollution Control in the Metropolitan Boston Area: a Case Study in Public Policy Formation, by Leslie Goldner.

Setting Criteria for Public Expenditures on Air Pollution Abatement: Theoretical Foundations and Limitations, by Harold Wolozin.

The last of these authors, Professor Wolozin of the American University, also contributes an introduction that surveys the whole volume.

Compared with Alan Smith's monograph, this book is most difficult to review. Not only are the aspects it deals with very varied, as the contents list shows, but they are, for the most part, to a British reader, curiously *foreign*. They could not be transposed to this country. This difficulty may be due to our failure to study the economic aspects of pollution as much as we should, on which Mr. Smith faults us, but more especially it seems to be due to the differences in the control situation in the two countries. Because of both our Clean Air Act and our Alkali Act we seem to have come to grips with air pollution more closely and more effectively than have the Americans, so that we have not the same need to strengthen and to justify the case for control by the elaboration of economic research and analysis.

To say this is not to criticise the book, but rather to express regret that it is not easy to distil from an American study an essence that could be used to advantage in Britain. The authors represented are all in positions of academic or other responsibility, and their writing reflects both their learning and their earnestness. There is a great deal of stimulating thought and much interesting illustrative information. To the student of either American work on air pollution or the economics of the problem as it is found in any country, this will be found to be a valuable guide book.

*More Reviews*

## Chimney Design

**Heat Transfer and Condensation in Domestic Boiler Chimneys, by L. F. Daws. National Building Studies Research Paper 40. H.M.S.O. 10s. net.**
**Chimney Design for Domestic Boilers. Building Research Station Digest 60. H.M.S.O., 4d.**

The growing demand for greater comfort in the home and the consequent increasing use of central heating have set new trends in house design. Fewer chimneys are needed, but those that serve central heating appliances need a higher standard of design and construction if long-term, trouble-free performance is to be assured.

"Heat transfer and condensation in domestic boiler chimneys" is therefore a timely publication. It sets out the results of research on chimneys undertaken by the Building Research Station of the Ministry of Technology, and discusses ways and means of achieving satisfactory design.

The functions of a chimney are to help induce the flow of air necessary to complete combustion of the fuel, and to vent the combustion products safely to the outside atmosphere. A badly designed chimney can encourage condensation which, in the absence of a protective flue liner, may eventually spoil internal decorations and damage the chimney fabric. It can also cause incomplete combustion, with dangers to health and safety if carbon monoxide is allowed to accumulate.

Both types of malfunctioning can be dealt with by designing the chimney to reduce heat loss from the flue gases. Simply, this means that the flue gases, by being kept hot, stay buoyant, and escape more rapidly from the flue. And the higher temperatures of the flue surfaces greatly reduces the risk of condensation.

Suitable lining of flues is one means of withstanding attack, and the Building Regulations for England and Wales which came into force earlier this year require that all flues in new construction should be lined. Even when the flue is lined, however, deposits can build up on the flue surface, liquid condensate can flow down the flue, and chimney "pull" may be insufficient to operate the appliance.

An improved general basis for assessing chimney performance has been established as the result of research, and this is discussed in the first part of the new book. In the second part the results are applied to the practical problems of domestic boiler chimney design. Suitable flue sizes, standards of thermal insulation, and the amount of air dilution required are quoted according to the size of appliance and the type of flue used. The practical design advice contained in the book has already been summarised and is available in the form of the B.R.S. Digest noted above. For those concerned with the theoretical aspect a series of appendices covers the detailed mathematical treatment of the problem.

## Gas Cleaning

**Industrial Gas Cleaning. W. Strauss. 471 pp. Pergamon Press, Oxford. £5.**

The sub-title of this work is "The principles and practice of the control of gaseus and particulate emissions". The author, who is Lecturer in Chemical Engineering at the University of Melbourne, has produced an excellent comprehensive text and reference book on a subject that is being given increasing attention and which calls for the integrated and balanced information that the book aims to provide. It will be found valuable for engineers and scientists in any industry that emits waste gases to the atmosphere, for students and research workers and for the manufacturers of flue gas cleaning equipment.

It relates the basic mechanisms of particle collection to their application in the design of gas cleaning plant, cyclones, filters, electrostatic precipitators, scrubbers, settling chambers and gas absorption systems. A special feature is the detailed discussion of particle mechanics, and the forces that can be used to remove particles from gas streams, not only in the types of plant in current commercial use, but also in new developments in the field of gas cleaning.

Other chapters explain the legal, health, and meteorological factors which provide the basic data for designing gas cleaning plant.

The book is well-printed and bound and our only criticism is the appalling design of the dust-jacket where, in colour, the general title of the series "International Series of Monographs in Chemical Engineering" is printed in almost illegible lettering. Fortunately the dust jacket can readily be lost.

**Fans. W. C. Osborne. 224 pp. Pergamon Press, Oxford, 40s.**

This text book, from the same publishers as the one noted above, is a volume of an international series of Monographs in Heating, Ventilation and Refrigeration. The book has been written primarily for students and does not set out to be an exhaustive work on the subject. It embraces the simple physical principles necessary for the proper application, control and design of fans.

*The Society's Presidential Badge, which has been remodelled and had a handsome chain attached to it thanks to the generosity of our Past-President, Lord Cohen of Birkenhead.*

# Natural Gas and Clean Air

by

*Sir Kenneth Hutchinson, C.B.E., F.R.S.*
*Deputy Chairman, the Gas Council*

**An address to the Annual General Meeting of the London and Home Counties Clean Air Advisory Council at the House of Lords on 29 July 1966.**

The story of the finding of natural gas under the stormy waters of the North Sea has been one of dramatic events with no less than four discoveries announced in the short period of six months. This followed three years of search and survey. The only way to get essential information at sea is by seismic survey, a method based on the one used to detect earthquakes. An explosion is initiated just below the surface of the sea and is reflected by different substructures, and especially at the interface of rocks of different kinds down to a depth of several miles. The exact time in milliseconds that the echoes take to return to each of a train of geophones strung out on a cable nearly two miles long is recorded electronically. Experienced geophysicists using refined methods can then interpret the subsurface structure, although since the velocity of sound varies widely according to the nature of the rocks there is room for quite a lot of speculation and differing interpretation. In the end they usually come to some degree of unanimity about the position of the structures thousands of feet below the surface where gas or oil could have been stored.

Surveying started in 1962 and continued actively through 1963, 1964 and 1965 at a total cost of £10½ m. The legal ownership of subsurface minerals including gas and oil having been decided in 1964 by international treaty which divided the North Sea among the adjoining sovereign states, the first round of licences was awarded by the British Government towards the end of 1964 giving each licensee rights and property in any gas or oil he might find.

At this stage each of the licensees had to consider how to exploit his property to the best advantage and as quickly as possible bearing in mind that the terms of the licence required him to give up half after six years.

There was considerable activity in design and construction of drilling platforms. Nine of these costing upwards of £2½ m. each were ordered from U.K. shipyards. A single platform fully commissioned and at work costs upwards of £5,000 a day to run. As it may take up to four months to drill and complete a well two miles deep drilling is an expensive business, especially if the well proves to be "dry."

Experience during the first part of 1965 was not very encouraging until in December there was a first announcement of a commercial find by B.P. on their block 40 miles off the mouth of the Humber. This was followed shortly by the disaster to their drilling platform "Sea Gem", with serious loss of life for causes which have not yet been identified. Then in April 1966 Shell-Esso announced the find of "considerable importance" 30 miles off Yarmouth followed quickly by the Gas Council/Amoco Group and the Phillips Group in blocks further out to sea (Figure 1). The position of these four discoveries, and the fact that they were all stated to be commercial on the basis of a single well, told experienced operators that here was something big. It is no secret that there is convincing evidence of the existence throughout this area of the conditions which account for the huge Slochteren field in Holland. Finally Home Oil of Canada reported a well in Yorkshire capable of a high rate of production although the extent of the field is not yet determined. It is to be hoped that they will be rewarded for their perseverence and enterprise in territory which had been explored for nearly 13 years by B.P. on behalf of the Gas Council.

Summing-up to date:—

Four gasfields capable of commercial exploitation on a combined scale of about 1,000 m.c.f.d. minimum. This represents 3,600m. therms p.a. which is about equal to the total output of the present British gas industry.

Indications of the existence of conditions suitable for discovery of large reserves of gas in a broad band of territory in the British part of the North Sea.

Confirmation of the validity of the prediction of geologists and the interpretation of survey information as shown by the high percentage rate of success of drilling in the Southern part of the North Sea.

While it is quite impossible to make firm predictions about the future the Gas Council has felt it sensible and prudent to base its long-term plans on the possible discovery of at least four times the above mentioned quantity of natural gas during the next ten years. This is roughly equivalent to the great Slochteren field in Holland. Meanwhile the Council is planning firmly to incorporate the first 1,000m. daily output into their existing and extended systems of transmission and distribution mains as soon as possible.

### Effect on the Gas Industry

Already by 1960 the industry had decided that it would reverse the trend of the previous five years and seek a new advance through effective marketing of their product. This coincided with the introduction of new methods of gas production from light oils and of natural gas imported in a refrigerated state from Algeria, but it will already be known that these new methods spelt the end of the former method of gasmaking by carbonising coal and with it the end of the production of gas coke.

The success of these efforts is well known; the overall rate of increase of gas sold is now running at 10 per cent with domestic gas increasing at 15 per cent. Gas shows every sign of taking over the major part of the domestic heating load, certainly in the South and probably soon in the North. The modern gas fire with an efficiency of over 60 per cent, of pleasant appearance, convenient and relatively cheap to use, has been astonishingly successful. One million were sold last year and over four million have been installed in the last few years. Even if there is some falling off in the rate as a result of growing saturation in the more accessible markets the challenge is being taken up by central heating, both for new dwellings where warm air systems are popular and for existing houses where small bore water radiator systems are the natural choice.

Before the North Sea discoveries the Gas Industry was predicting a continuing rate of increase of 10 per cent for some years ahead and preparing for a doubling of its present size in seven to ten years. The finds so far announced and the amount of gas that is on offer could easily be absorbed in that time but with the added incentive of natural gas this can probably be done in five years.

It will be regrettable if in the interests of an even faster absorption and before further reserves have been proved we should follow the example of Italy and France where the limited natural gas resources were directed to such use as power generation when lower grade fuels would have been equally serviceable, and where the overall efficiency of conversion is such that more than 60 per cent of the heat of the gas is wasted in rivers or in the air. Both these countries may well be regretting their former decisions at a time when they are having to make new contracts for the importation of natural gas from abroad.

The strategy of natural gas use in this country should be to direct it first to those applications where a clean sulphur free fuel can be used to the best advantage and at the highest efficiency, priority being given to the heat process industries and to domestic use. The rate of offtake should be conservatively assessed so that each discovery can have a life of 30 years or more, at least until it is established that new discoveries are being made as fast as the old ones are being used up. After all it took nearly 300 million years to put the gas there and we can afford to be careful how we use it.

### Effect on Clean Air

It is in the fulfilment of clean air (really clean, that is smoke and sulphur free) that natural gas can make its greatest contribution to the well being of the people in a modern, mainly urban, civilisation such as ours. The original plans for clean air were based on the elimination of smoke only. Industrial commercial and other large scale users of fuel were made to provide the equipment to burn coal smokelessly. Many however preferred the easier route by way of oil and there has been no reduction in the sulphur content of the atmosphere—rather the reverse. The domestic solution was seen in terms of the open fire (considered ten years ago to be an essential feature of the British home) and of solid smokeless fuel capable of being burned in such a fire. What was not foreseen was that the British public was quite capable of changing its mind and has in fact done so, and that the economics of gas manufacture would change so drastically as to make the production of coke no longer economic.

It is now possible to produce gas and sell it at a price which makes the provision of heat in the home as cheap as from solid fuel. The existence of four million gas fires and 550,000 central heating installations has already made a contribution to clean air which is probably comparable with that of the official policies. Even if all the remaining eight million homes now connected to gas were to install a gas fire, their total gas consumption would be little more than half the quantity of gas already available from the North Sea.

It is quite impossible to make any promises about price but all the indications are that with an increasing availability of natural gas the price of gas distributed to the public will become increasingly competitive against other forms of heat.

A realistic clean air policy should therefore now be based first on the recognition of gas as the basic fuel for domestic heating, and every encouragement should be given to this objective. It is not suggested that there should be any infringement of the right of people to choose from among the alternatives available to them but there is little doubt that the convenience and flexibility of gas at a competitive price (aided by the counter attraction of television) will quite shortly bring about a complete change in attitudes towards the open fire.

The logical outcome of this is that in the near future new houses will all be equipped with some form of distributed heat and central heating will be a necessity, no longer a luxury.

Having in this way disposed of the domestic smoke and sulphur problem, with its special difficulty of low level discharge, and having satisfied the needs of essential industries, the next objective as increasing quantities of natural gas become available should be the commercial market, especially the heating of blocks of flats and offices, hotels and other similar establishments which also tend to discharge their sulphur-containing waste at relatively low level.

It is not suggested that all this can be done yet, but to get the problem in its right perspective, if the total of the coal, coke breeze and oil used for burning in Greater London were replaced by natural gas, making allowance where appropriate for increased efficiency in use, the quantity required would be 2,800m. therms a year. This is three-quarters of the amount now available from the North Sea and could be brought to London in two 36 in. diameter pipelines.

All gas-using appliances will have to be converted to use natural gas, a task which may take five to ten years to complete. During the intervening period some districts will be on existing town gas and others on natural gas. The Canvey conversion operation has pointed the way but naturally a city of the size of London presents special problems. Seasonal and peak load demands will be dealt with by storing natural gas underground in aquifers or in liquid form in frozen ground storage and by some variation in the rate of off-take from the gasfields. These problems are simpler with natural gas than with traditional town gas as it is no longer necessary to provide manufacturing plant to match the ultimate peak load.

Any one who has lived and worked in and around London for the last 40 years must be struck now by the increasing clarity of the London air, and this is a great tribute to the tremendous efforts of all concerned. In Greater London smoke control orders cover more than half the black areas and this is a much better record than anywhere else in the country, and it is understood that more than half the conversions now going on are to gas. Although there is some way to go before the work of eliminating all the smoke is completed and the sulphur content of the air reduced to vanishing point, there is little doubt that these objectives can be attained in a relatively short time when sufficient natural gas becomes available, always provided that the right policies are pursued in the use of that gas.

As a result of some doubts that arose with regard to the availability of solid fuel there seems to have been a certain slackening in the advance of clean air. It is to be hoped that it will not require another disastrous smog like that of 1952 to convince everyone concerned that the case of clean air must go ahead again with renewed vigour so that people can live in cities that are fit to breathe in.

### Some Questions

In response to questions Sir Kenneth said:—

(1) That natural gas is non-toxic and unlikely to be any danger to health. It was of course inflammable and the same care should be taken as with town gas in dealing with any escapes.

(2) That natural gas has twice as high a calorific value as town gas. It might first be used to produce a gas identical with town gas but later it would pay to convert consumers' appliances so as to use the gas directly.

(3) That methane and natural gas were often used as names interchangeably. Methane was the first and simplest of the hydrocarbons and natural gas usually contains over 90 per cent of it but may contain other constituents as well.

(4) That the natural gas so far found has been completely free of sulphur except for a little that has to be added to give it a characteristic smell. Even when natural gas is found associated with oil, which may have a high sulphur content, it is normally purified so as to be almost completely free of sulphur.

(5) That it is estimated that the cost of adjusting burners and replacing parts and all the work that is associated with the transfer to natural gas is about £30 per consumer. It would be the responsibility of the Boards to carry this out but they would probably use contractors for most of the work.

(6) That it has been decided to specify that all equipment now being provided should be readily convertible in future to natural gas.

(7) That although no substantial quantity of oil had yet been found in the North Sea there was no reason to believe that oil could not be present and might not ultimately be discovered.

### Garden Bonfires

We recently (Winter, 1965) commented on the frequent nuisance caused by smoke from garden bonfires, and have now received an illustrated leaflet on this problem from the Henry Doubleday Research Association (20 Convent Lane, Bocking, Braintree, Essex) called "Give up Smoking Bonfires". It is estimated that 300,000 tons of garden rubbish is burned in Britain every year and gives sound advice on composting that will be of value to garden owners, and especially to those anxious about the humus content of their soil. Advice on leafmould making and the disposal of grass mowings is particularly helpful.

# Smoke Control in the North West

## *Survey of Smokeless Fuel Needs*

An important survey of the smokeless fuel needs over the next few years in the North West area has been carried out and published in the form of a printed report. This has been done by a new *Joint Committee of North Western Black Area Local Authorities*, and the report has been issued from the office of the Town Clerk of Manchester.

The committee was set up as a result of the suggestion made in the Ministry Circular 69/63 and the recommendation in the White Paper on "Domestic Fuel Supplies and the Clean Air Policy." The committee was appointed in 1964 with the agreement of a large majority of the local authorities of the North West region of "black areas."

The Committee is charged with the duty of ensuring so far as possible that the supplies of all smokeless fuels are adequate in quantity, quality and price to meet all anticipated needs in the region.

The committee have obtained detailed information from the local authorities concerned, and the report tabulates this information in a series of tables in which the replies are given to a questionnaire sent to each authority. This asked for approximate total number of dwellings in the area of the authority; the number of dwellings covered by smoke control orders up to the end of 1964; the number of additional dwellings to be covered by smoke control orders in each of the years 1965 to 1969; and the additional smokeless fuels required in each of these years under the heading of solid smokeless fuels, gas, off-peak electricity and on-peak electricity. Lastly, each authority was asked to give the number of dwellings remaining to be dealt with between the end of 1969 and the date of the planned completion of the programme.

Table 1 gives a summary of the replies, and following tables give the details as received from each individual authority. The information thus obtained and published in this classified and ordered form will be of immense value not only to the local authorities themselves, but also to the fuel industries in planning both the production and the distribution of the additional fuels to be called for.

The overall situation is summed up in the following table, taken with a little simplification from the introduction to the report.

This looks reasonably satisfactory, but the disturbing feature revealed by the inquiry is that about 670,000 dwellings will remain to be dealt with after 1969 in the North Western

AMOUNTS BY WHICH YEARLY CONSUMPTION OF SMOKELESS FUEL IN 1969 WILL AS A RESULT OF SMOKE CONTROL EXCEED YEARLY CONSUMPTION IN 1964.

| | *Additional dwellings to be subject to operative smoke control orders over period* 1965-69 *inclusive* | *Solid Smokeless Fuels (thousand tons)* | *Gas (million therms)* | *Electricity (million KWH)* | |
|---|---|---|---|---|---|
| | | | | *Off-peak* | *On-peak* |
| Black areas .. | 436,480 | 775 | 45 | 242 | 71 |
| Non-black areas | 24,056 | 44 | 2 | 15 | 3 |
| Total .. | 460,536 | 819 | 47 | 257 | 74 |

"black areas" if smoke control is to be extended in accordance with the Beaver Committee recommendations.

The Joint Committee that has produced this report is to be congratulated on its enterprise, and its action may be commended to other areas, especially in the north and midlands.

## SYMPOSIUM ON DISTRICT HEATING

More information is now available about the symposium being organized by the Institution of Heating and Ventilating Engineers, to be held on 21 and 22 March, 1967, at Church House, Westminster. A press notice from the IHVE points out that:

"It has frequently been observed that district heating has made far greater progress on the Continent and in America than it has in the United Kingdom. The I.H.V.E. Journal itself has published papers which draw attention to some of the advantages that result from its installation. There are however, certain disadvantages and under the set-up in this country certain limitations and difficulties are encountered which make it extremely difficult for an operator to initiate such a scheme.

"The aim of the March Symposium is to clarify the issues involved and will we hope trigger off a useful debate which will take into account population growth comfort, utility and amenity in terms of full central heating to Parker Morris standard. It will also focus attention on legal and administrative details, the national economy and the important question of raising the initial capital.

"We have been extremely fortunate in obtaining Sir Donald Gibson, Director General of Research and Development of the Ministry of Public Building and Works to present the first paper. In addition he has kindly consented to take part in a discussion on the points that he puts forward. Authors for papers on national aspects of the problem will be provided by Mr. Arnold Marsh, Director of the National Society for Clean Air, on Atmospheric Pollution; Dr. G. Taylor, on certain medical aspects that are encountered at present e.g. hypothermia. The effect of district heating on the national economy will be put by Dr. A. Parker, Consultant, and legal administrative pitfalls will be outlined by Mr. Michael Pritchard of Sharpe, Pritchard & Co.

"Unlike the financial problems encountered in district heating it can be assumed that there is a solution to all of the technical problems. The former will be discussed in a paper to be presented by Mr. H. H. H. Helby. A brief review of the latter will be given by Mr. R. M. E. Diamant, lecturer at the Salford Royal College of Advanced Technology.

"Finally it was considered advisable to have a closer look at progress made on the Continent as this might usefully illustrate the different administrative backgrounds and methods to be found in these countries. A paper on activity in France and Germany will therefore be given by Mr. Peter Hawkins of the Compagnie Générale de Chauffe and on Scandinavia by Mr. F. E. Olsen a Danish engineer. Mr. George A. Rooley will then give his paper on Experience in the United Kingdom. The summing up will be given by Mr. G. H. Buckle, Consultant. Adequate time has been provided for discussion on each of the above papers.

The President, Mr. J. C. Knight, will preside at the opening and closing sessions. Other sessions during the two day symposium will be chaired by Lord Robens, A. G. Shepherd Fidler, W. L. Wilson, E. G. Brooks, J. R. Kell, R. Harrison and Ian H. Duff.

**Exhibition**

In addition to the papers to be given in the Assembly Hall of Church House a small exhibition of illustrations and other data can be examined in the Hoare Memorial Hall. A cocktail party will be held in Church House at 5.30 in the evening of the first day.

Early application should be made to the Secretary, 49 Cadogan Square, London, S.W.1.

### Resolution on Vehicle Pollution

The 20th Branch conference of the Women's Gas Federation, representing a membership of 17,144 from 189 branches throughout the country, unanimously passed the following resolution:

"In view of the wholly deleterious effect of all forms of air pollution on the health of the nation, H.M. Government is urged to intensify and extend measures already taken to secure effective control of dark smoke from diesel lorries and to take steps to prevent the emission of dangerous and obnoxious fumes from petrol-engined vehicles."

# ALKALI INSPECTORS' NEW REPORT

*Standards Set by the Public*

**102nd Annual Report on Alkali &c. Works, by the Chief Inspectors, for 1965. pp.82. H.M.S.O., London. 7s. 6d. net.**

The new report seems to be even more informative than ever, and continues to be an invaluable source book of information on all the many processes which come under the wings of the Alkali Inspectorate. The new edition has, for the first time, some illustrations, and we are very glad to see a detailed list of contents, which make reference to any particular process much easier.

The Chief Inspector for England and Wales, Mr. F. E. Ireland, has some interesting observations in his introductory paragraphs, especially when considered in relation to the references to the Inspectorate and the economic cost of air pollution made on other pages of this issue of *Smokeless Air*.

He recalls that a decade ago it was estimated that half the smoke emitted in the country came from industry and half from domestic fires. The present situation is that industry has progressed more rapidly in smoke control than the domestic side, and now about 75 per cent of smoke comes from homes and only 25 per cent from industry.

On the other hand, industry has other problems of air pollution besides smoke, and the combination of annually increasing industrial production and increased standards of comfort in the home means "we have to run faster in order to keep still" in combating the problem. He writes: "All the important trends of future growth in this country promise a steadily worsening position unless early action is taken".

In the long run, the Chief Inspector continues, public opinion sets the standards for clean air, and notes an increasing public awareness of air pollution as a social evil.

He urges a two-pronged, co-operative approach by local authorities (who make smoke control areas to prevent smoke from domestic fires) and by the Alkali Inspectorate (whose job is to help industry achieve the best practicable means of minimizing air pollution) but stresses that a co-operative approach does not mean waiting for the other side to make progress.

The Chief Inspector goes on to point to the need for prevention of pollution rather than its subsequent dispersion, particularly in view of the increasing numbers of tall buildings. These are having a significant effect both on dispersion and on exposing people to potentially greater concentrations of pollution in the upper air.

### Heavier Pollution Trends

The report states: "A close liaison has been maintained with the Medical Research Council and other organisations studying the effects of air pollution and a careful watch is kept on trends. All the important trends of future growth in this country promise a steadily worsening position unless early action is taken. We have seen in earlier Reports how industrial production has increased year by year in many spheres, and greater standards of comfort are being required in the home. What this means is that we shall have to "run faster in order to keep still" so far as air pollution is concerned. A greater and greater population is demanding more and more goods and services per head of population, which will produce greater quantities of waste products needing disposal. It is the pollution which reaches lung level which is of greater importance than mass emission but there is surely a limit to the amount we can disperse in the atmosphere, especially in this "concentrated" country of ours. The inspectorate has gained a respite with its tackling of dispersion by a more informed approach than ever before and the Memorandum on Chimney Heights is proving a boon to local authorities. It is becoming more and more necessary to solve the problems of prevention rather than dispersion for the modern habit of erecting tall buildings is having a significant effect of dispersion and the exposure of the public to potentially greater concentrations of pollutants in the upper air.

Dispersion can never be a substitute for prevention and it seems to me that among the major air pollution tasks of the immediate future sulphur dioxide, grit and dust, internal combustion engine exhausts and domestic emissions should be given the highest priorities."

The report states that liaison between inspectors and officers of local authorities continues on a friendly and helpful basis. There is a continually strengthening awareness by local authorities about the place of air pollution as a significant factor of planning and the inspectorate is being drawn more and more into discussions in the early stages when urban areas were being replanned following demolition of old property.

The total number of visits and inspections during 1965 was 11,105 compared with 11,566 in 1964, including 111 special visits by the chief and deputy chief inspectors. Of this total 224 were to or in connection with works not registered under the Act, 39 were concerned with control of radioactive emissions and 14 were to or in connection with colliery spoilbanks. During the inspections 3,990 quantitative analyses were made of gases evolved from the processes in operation compared with 4,563 in 1964. In addition 860 special samples compared with 746 in 1964 were taken and submitted to the Government Chemist.

### Administration

There are now 25 Inspectors in England and Wales: the Chief and two Deputy Chiefs in London, twelve District Inspectors, and ten others. In Scotland there is the Chief Inspector and two Inspectors.

### Scotland

In his annual report for 1965 to the Secretary of State for Scotland, the Chief Alkali Inspector for Scotland, Dr. E. A. B. Birse, indicates that the measures taken by firms to prevent discharge of noxious and offensive gases from registered premises were generally satisfactory.

There was a steady continuation of the improvement in the arrestment of grit and dust from electricity generating stations and Dr. Birse makes reference to the useful work done in this connection by the dust testing team on contract from the Ministry of Technology.

Dr. Birse reports on the progress made by the steel industry in dealing with fumes from electric arc furnaces. Electrostatic precipitation plant was installed during the year with satisfactory results at one large arc furnace and a smaller plant was in course of installation at a still larger furnace. Interest was also being shown among users of smaller arc furnaces in a possible method of fume suppression by the fuel oxygen system of refining.

The use of coal carbonisation for the production of town gas was 0.9 million tons. This is a reduction of 0.2 million tons compared with last year and reflects the closure of gas works carbonising coal and the increasing use of oil.

Crude oil throughput was 4.6 million tons, most of which was refined in the Grangemouth area. With such a concentration in one area. Dr. Birse comments that some noticeable effluvia are inevitable and a number of complaints were received during the year.

The total number of visits and inspections throughout the year was 638, of which 409 were to premises registered under the Act. Thirty-seven chemical tests were taken during the year to check whether the provisions of the Act were being carried out. Most of the samples taken were analysed by the Inspectorate themselves. The dust testing team made 49 visits to various works and carried out 187 tests. This was a considerable increase in the number of tests compared with previous years and was largely due to a revised and more rapid method of testing which has been evolved.

## DISTRICT HEATING DEVELOPMENT

*N.C.B. Joins in New Company*

The National Coal Board in conjunction with Solar Industries Ltd., of Glasgow, and Compagnie Générale de Chauffe, of Lille, who are the largest heat service operators in France have formed a company to promote and operate district and group heating installations using solid fuel, in this country.

The new company, Associated Heat Services Ltd., will be able to offer a comprehensive heat service to local authorities, new town corporations and industrial estate developers, hospitals, universities, schools and others with large-scale heating needs. The service will cover financing, designing, installing, operating and maintaining boiler houses, boiler plant and distribution systems. It will include, where necessary, the installation and reading of heat meters and the collection of acounts for heat supplied: and similar services can be offered to existing users who wish to be relieved of all problems concerned with the supply of heat.

These services are in line with the growing demand by both current and potential customers for an all-in service which, in return for an agreed charge, relieves them of the worries of operating a boiler house, and gives them automatic heat at the point of use.

This trend has been disclosed by the National Coal Board's own recent market research. There is now clear evidence that there is a considerable potential for solid-fuel-fired group heating in the rehousing schemes that are coming along, in new towns and in the relocation of commercial and industrial premises. To realize this potential, solid fuel must offer automatic heat through a service that is comprehensive, completely flexible to user requirements and capable of the widest scope of development.

Compagnie Générale de Chauffe was founded 30 years ago, employs 2,500 people on heating installations in Belgium as well as in France and is responsible for heating more than 70 hospitals, 80 public buildings, 50 universities and colleges, and 230 schools, and for operating 230 group heating schemes. Their boiler houses use annually 250,000 tons of coal.

The National Coal Board, who were the pioneers among the fuel industries of district and group heating in Britain have, in conjunction with Local Authorities, a total of 26 schemes in operation, under construction, or in the final stages of negotiation. These include the new town centre development at Billingham (Co. Durham) and heating of groups of high flats at Sunderland, Oldham, Leicester (Rowlatt's Hill), Bridgend (Glamorgan) and Edmonton (Greater London Borough of Enfield).

### The Breath Penalty

This is the neat title of a leading editorial in the *Coal Merchant and Shipper*. (25 June), which reviews the problem of air pollution from road vehicles, which, it is said, will show that the journal "still keeps a watchful eye on the many spheres closely orbiting the coal trade. The survey looks at pollution from both diesel and petrol vehicles, and after considering the dangers from carbon monoxide says that "it may well be that the Clean Air Society needs to revise its overall policy on air pollutants." (*We do not think this will be necessary: the Society has given abundant—and constructive—attention to these problems, and the forthcoming report on the subject will further demonstrate our concern—Ed.*)

# Coal Supplies and Carbonization Processes

THE June, 1966, issue of *The Mining Engineer* includes a paper read in September last year by Dr. N. M. Potter and H. B. Locke, to the North Staffordshire Institute of Mining Engineers, on *Coal Supplies and Carbonization Processes*. This is a most useful and authoritative survey of the smokeless solid fuel situation and prospects, which we would have been glad to reprint in full if copyright considerations had permitted. Dr. Potter is Deputy Technical Director, Coal Products Division, N.C.B., and Mr. Locke is Manager of the Industrial Chemistry Group, National Research Development Corporation.

The paper begins by pointing out that about one-quarter of the National Coal Board's output is heat treated, or coked, to yield carbonized products. It then discusses the coke oven industry, and concludes that there is unlikely to be any serious change in coke production, either upwards or downwards, in the next ten years. The gas industry is then reviewed. Rapid changes are proceeding because gas can be made much more cheaply from hydrocarbon feedstocks than from coal, and by 1970 the industry may require no more than 10 million tons of coal.

Then follows a section on the domestic smokeless fuels, describing those available for different purposes. This information is summed up in a table (No. 6 in the paper) which we reproduce.

Finally, the authors give their conclusions, which we are able to quote in full.

**The Conclusions**

"The trends in the utilization of coal for coke, chemicals and gas-making are clear and unlikely to change over the next 10 years."

"Nuclear energy, oil and natural gas are taking over the rising demand for heat and power in the expanding economy. Refined oil products are simpler and cheaper to use as feedstocks for chemicals and gas, than coal is for carbonization. Existing processes of coal gasification are no longer commercially competitive. Fortunately, research is continuing in the Gas Council, the British Coal Utilisation Research Association, and also in other countries: and some of the processes now being studied, particularly coal hydrogenation at the Gas Council's Midlands Research Station at Solihull, may eventually yield cheaper gas. Until then, because of the falling coal requirements of the gas industry, many good quality coals will become avaiable for the newer smokeless fuel processes."

"While the total industrial requirement for coke will probably remain at about the present level (mainly for blast furnaces), the domestic fuels are most vulnerable and require much effort to obtain a growing share of the markets. There is considerable and expanding scope in central heating and a rising potential demand for premium open fire fuels, not only in smoke control areas but elsewhere. A plentiful supply of first-class smokeless fuels for the open fire and closed stove at competitive cost would enable the implementation of the Clean Air Act to be accelerated. The overall result of these factors is that, in spite of the decline in the demand for gas-making coals, the total quantity of coal subjected to heat treatment is unlikely to change substantially: and as the processes involved are changing, so the coal specifications are becoming more stringent."

"The importance of coal quality in preparation has been stressed: markets

**Classification of smokeless fuels by use, reactivity, size and parent coal rank**

(*From the Paper by Potter and Locke*)

——— INCREASING REACTIVITY ———→

| *Parent coal type & rank* | *For large closed appliances* | *For small closed appliances* | | *For improved open grates* | *For stool bottom grates* | | *No grate required* |
|---|---|---|---|---|---|---|---|
| Anthracite Rank 100 | | Anthracite (5–9)<br>Multiheat (8–12) | | Multiheat | | | |
| Dry steam Rank 201 | | Phurnacite (3–5) | | Phurnod | | | |
| Coking steam 202–204 | (H.T.C.O.)*<br>Foundry | | | | | | |
| Prime coking 301 | Coke | | | | | | |
| Very strongly caking—401 | Nuts (0.5) | (H.T.C.O.)<br>Sunbrite (1) | (G.C.) Sebrite nuts | (G.C.) Sebrite (3) | | | |
| Strongly caking 501–502 | | | (G.C.) Gloco nuts | (G.C.) Gloco (3) | | | |
| Medium caking 601–602 | | (H.T.C.O.)<br>Sunbrite (2) | (L.T.) (10) Coalite<br>Coalite nuts | (L.T.) Coalite (10) | (L.T.)<br>Char<br>Briquettes<br>Room-heat<br>Home-fire<br>(20–25) | (L.T.) Coalite (7) (10) | |
| Weakly caking 701–702 | | | (G.C.) Cleanglow nuts<br>(G.C.) Phimax nuts | (G.C.) Clean-glow (4)<br>(G.C.) Phimax (4) | | (G.C.) Cleanglow (4)<br>(G.C.) Phimax (4) | |
| Very weakly caking—801 | | (L.T.) Rexco nuts | | (L.T.) Rexco | | (L.T.) Rexco (8) | |
| Non caking 901–902 | | | | | | | |
| Wood | | | | | | | Charcoal |

——— INCREASING REACTIVITY ———→

*(H.T.C.O.) = high temperature coke ovens; (G.C.) = gas retorts; (L.T.) = low temperature plant; ( ) = volatile matter content per cent

will only be retained if there is customer satisfaction in the face of hard competition. Convenience and price are the main factors. Convenience depends not only on the appliance but on the quality and consistency of the fuel. Even with the best appliances, solid fuels however good normally involve actual handling which gas, oil and electricity for space heating generally do not: but the cost saving can outweigh such inconvenience as there may be—and which need only be very small indeed. It is vital that the existing price differential in favour of solid fuels should not only be maintained but improved.

"The trend elsewhere in the world is to regard the "British" open fire as a luxury, with the main domestic heat load carried by non-solid fuels. Indeed, Great Britain has been almost unique in its slavish adherence to the less efficient open fire. But fires are improving: and nowadays the glass-fronted closed/openable stove is fast becoming the most popular new appliance in the home, especially when fitted with a back boiler.

"There are adequate reserves to meet the requirements for special coals: and the present range of processes to make smokeless fuels can meet all future demands. The needs of the customer must come first and foremost from the first stage of planning to the last stage of production and delivery; and the standard of coal preparation for coals which are processed can never be better than the consumer requires."

*Divisional News*

# Smoke Control in the North East

## Review by L. Mair

A meeting of the North East Divisional Council was held in Newcastle on July, 15th, 1966 in the Department of Civil Engineering, University of Newcastle upon Tyne. At this meeting the Honorary Secretary, L. Mair F.R.S.H., F.A.P.H.I., delivered a paper entitled "The Past History and Present Problems of Smoke Control Areas."

In his address Mr. Mair briefly outlined the historical development of the "smokeless zones" idea, first propounded in 1936 and referred to the efforts of various local authorities in obtaining private powers to pursue this principle of securing smokeless zones. He compared the provisions of these local acts with the present powers of the Clean Air Act but expressed the view that as local acts could be, as it were, regarded as adoptive the result was that the effectiveness of the smokeless zone principle was dissipated and it was obvious that the voluntary action of local authorities not acting in concert would never provide a real and lasting solution. The speaker referred to the prediction of the Beaver Committee who expressed the hope that a reduction of some 80 per cent of the pollution of the heavy populated areas could be achieved within 10 to 15 years of action being taken and he compared this hope with the progress which had actually been secured. By reference to a series of graphs the speaker deplored the slow progress in the northern region where only some 14.9 per cent of smoke control area coverage had been achieved compared with some 53 per cent in the Greater London area. He accounted for this by reviewing some of the problems peculiar to the industrial areas and made special reference to the "fuel crisis" of 1963 which resulted in certain northern regions being restricted to hard coke with the consequent substantial increase in the cost of conversions.

To demonstrate the need of greater activity in smoke control in the industrial areas he referred to a graph in which he listed ten selected county boroughs with a population and physical topography similar to that of Newcastle upon Tyne.

In ascending order of magnitude of smoke pollution Sunderland and Newcastle topped the table and it was very doubtful consolation to know that of the ten towns involved two showed higher figures than Newcastle in relation to concentrations of sulphur dioxide. Mr. Mair went on to outline the reasons for the increased costs of conversions and submitted this factor as a major cause of delay in achieving smokelessness. He submitted that the most urgent need for smoke control were in the black industrial areas of England and Wales, areas which, in the main, are the sources of Britain's prosperity. He described these areas as areas which produced the murk and grime of industrial life and deplored the fact that workers in these areas must live in the area pollution which they themselves had created. He expressed the view that one could hardly blame the heavy industrial worker for casting an envious eye on the standards of living and the living conditions in the southern counties and south coast where residents enjoyed their share of prosperity in comfort and environmental refinement. The coal fields, the iron works and the factory, he continued, contribute more meaningfully to the prosperity of Great Britain than do the Stock Exchange or the air conditioned commercial office blocks of the south east and if national prosperity is a commodity to be shared on a national basis, he asked why should not the evils arising from industrial production also not be dealt with on a national basis.

In conclusion he argued that the air pollution problem should be regarded as a national problem and that all local authorities should be freed from any financial burden in dealing with it. In conclusion he suggested, as a basis for discussion, that the cost of conversions be shared between the householder and the Exchequer in the proportion of 3 : 7 respectively.

Mr. Mair's address provided an extremely lively discussion which had to be terminated because of limitation of time. This discussion was followed by three clean air films—"Wealth Under the Sea" and "Clearing the Air" both by the Gas Council, and "Homefire" by the National Coal Board. The meeting concluded with refreshments kindly provided through the good offices of Professor P. C. G. Isaac of the Department of Civil Engineering who is also Vice-President of the North East Divisional Council.

### Yorkshire Division

The Division met in Leeds on 13 June, and after a business meeting in the morning, saw in the afternoon a film of central heating with metered oil supply. This is on a 3300 house estate at Yate-Sudbury in Gloucestershire. Members were entertained to a buffet lunch by Shell-Mex and B.P. Ltd.

On 14 July the Divisional Council visited the works of W. C. Holmes and Co. Ltd., at Turnbridge, Huddersfield, and were afterwards the guests of the firm for lunch.

### East Midlands Division

The major industrial developments taking place on Humberside, which will of course be accompanied by housing, provide an important opportunity for planning for the avoidance of air pollution. This was the background reason for a meeting of the Division on 8 September, held in Grimsby.

In the morning the 75 members attending were taken on a tour by bus of the Humber Bank, seeing the extensive developments and new housing. Commentaries were given by Mr. R. L. Pawson and Mr. A. Radley, District Alkali Inspectors.

In the afternoon, after a welcome by the Mayor of Grimsby (Alderman W. J. Molson), a paper on "The Treatment of Industrial Emissions" was given by Mr. Pawson. Professor J. K. Page of the University of Sheffield spoke of his interest in the Humberside development and said that the N.S.C.A. had an important part to play in the economical growth of the area.

# SMOKE CONTROL AREAS

## Progress Report

### POSITION TO 1 JULY, 1966—TOTALS

| | England and Wales | Scotland |
|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation | 44 | 1 |
| *Acres*, 3,400 | | |
| *Premises*, 41,060 | | |
| **Smoke Control Areas in Operation** | 1,878 | 65 |
| *Acres* | 441,482 | 26,830 |
| *Premises* | 2,454,166 | 151,280 |
| **Smoke Control Orders** | | |
| Confirmed | 217 | 14 |
| Submitted | 95 | 6 |
| **Grand Totals** | 2,234 | 86 |

*The lists below are supplementary to the information in the last issue of "Smokeless Air" (Summer 1966)which gave the position up to 1 April, 1966. They now show changes and additions to 1 July 1966.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.*

### NEW SMOKE CONTROL AREAS IN OPERATION

**Northern**

*Tyneside and Wearside*

Gateshead C.B. Nos. 7 to 9, Newburn U.D. Nos. 4 to 6, Wallsend C.B. Nos. 3 and 4.

*Teeside*

*Billingham U.D. No. 3, Middlesbrough C.B. No. 4.

**Yorkshire**

*West Riding (North)*

Aireborough U.D. No. 18, Batley B. No. 4, *Bradford C.B. (Allerton), Brighouse B. No. 10, Horsforth U.D. No. 8, Leeds C.B. No. 51 Moortown (Meanwood Park), Morley B. Nos. 30 and 31, Pudsey B. Farsley (North) No. 4, Queensbury and Shelf U.D. No. 5, Stanley U.D. (South Stanley No. 1) and 2.

*West Riding (South)*

Rotherham C.B. Wickersley Road No. 3, Sheffield C.B. No. 16, Swinton U.D. No. 9.

**North Western**

*South Lancashire and North-East Cheshire*

Audenshaw U.D. No. 4, Denton U.D. No. 11, Eccles B. No. 6, Heywood B. Nos. 5 and 6, Hyde B. No. 4, Manchester C.B. No. 14 and Manchester C.B. (Didsbury), Salford C.B. No. 11, Stockport C.B. No. 6, Stretford B. No. 7, Worsley U.D. (Armitage Estate and Part Hulton E. Ward).

*Central Lancashire*

Burnley C.B. Nos. 4 and 7, Preston C.B. No. 13.

*Merseyside*

Bebington B. (Area No. 19), Birkenhead C.B. (Areas No. 13 and 14), Liverpool C.B. No. 18, St. Helens C.B. No. 1, Warrington C.B. No. 7, Widnes B. No. 5.

**Midlands**

*West Midlands*

Aldridge U.D. (New Estates Nos. 17 to 21), (Streetly) No. 22 and (Coppy Hall Estate) No. 23, Birmingham C.B. Nos. 79 and 80, Halesowen B. Nos. 24 and 26, Solihull C.B. Nos. 5 and 6, Stourbridge B. Nos. 21 and 22, Sutton Coldfield B. Nos. 4 and 5, West Bromwich C.B. No. 15, Wolverhampton C.B. (West Central Area) and No. 9.

*Potteries*

Stoke-on-Trent C.B. No. 10, Newcastle-under-Lyme B. No. 5, Kidsgrove U.D. No. 10 (their No. 11).

**London**

*Greater London Council*

Barking L.B. Nos. 9 and 10, Brent L.B. No. 1 (Tokyngton), Crayford U.D. No. 3 (Bexley L.B.), Croydon L.B. No. 7, Ealing L.B. No. 21, *Finchley B. No 10 (Barnet L.B.), Greenwich L.B. No. 6, Hammersmith L.B. No. 8, Harrow L.B. No. 10, Havering L.B. No. 1, Hendon B. No. 13, (Barnet L.B.), Ilford B. No. 7 (Redbridge L.B.), Islington L.B. (Areas 20 to 23), Lambeth L.B. Nos. 12 to 15, Redbridge L.B. No. 8 (Hainault) Stepney L.B. Nos. 5 and 6 (Tower Hamlets L.B.).

**Local Authorities outside the Black Areas**

Brentwood U.D. No. 5, *Burton-upon-Trent No. 1, Chatham B. No. 4, *Crewe B. No. 3 (their No. 2), Grantham B. Nos. 9 to 11, Harlow U.D. No. 5, Mold (Wales) U.D. No. 1, Skelmersdale U.D. No. 1, Staines U.D. No. 6, Winsford U.D. No. 8.

## NEW ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*

Hebburn U.D. and Jarrow B. (Monkton Hall)

*Teeside*

Hartlepool B. No. 2, *West Hartlepool C.B. Nos. 3 and 4.

**Yorkshire**

*West Riding (North)*

Bradford C.B. (Wyke), *Elland U.D. No. 2, Leeds C.B. Nos. 52 to 56, Ossett B. No. 9A, Rothwell (Yorks) U.D. Nos. 8 to 10, Shipley U.D. No. 8, Sowerby Bridge U.D. No. 3, Spenborough B. No. 7.

*West Riding (South)*

Darton U.D. Nos. 1 and 2, Sheffield B. No. 20, Swinton U.D. No. 11.

**North Western**

*South Lancashire and North-East Cheshire*

Ashton-under-Lyne B. No. 7, Bolton C.B. (Victoria Road), *Chadderton U.D. No. 7, Dukinfield B. (Dewsnap), Oldham C.B. No. 7, Sale B. No. 7, Urmston U.D. No. 8, Westhoughton U.D. No. 3.

*Central Lancashire*

Church U.D. No. 5, Colne B. No 4, Padiham U.D. No. 7, Preston C.B. No. 15.

*Merseyside*

Ellesmere Port B. No. 6, Liverpool C.B. Nos. 19 to 21, Runcorn U.D. No. 3, St. Helens C.B. Nos. 2 to 4, Warrington C.B. Nos. 8 and 9.

**Midlands**

*Derby, Nottingham and Chesterfield*

*Chesterfield R.D. No. 5, (Eckington West) and *Chesterfield R.D. No. 7, (Killamarsh), Dronfield U.D. No. 2, Sutton in Ashfield U.D. No. 2.

**North Midlands**

Leicester C.B. No. 16.

**West Midlands**

Aldridge U.D. No. 26, *Birmingham C.B. No. 99, Birmingham C.B. Nos. 123 and 124; 126 and 127; 129 and 132. Wolverhampton C.B. No. 10A.

*Potteries*

Newcastle-under-Lyme B. No. 6, Stoke-on-Trent C.B. Nos. 7 to 9 and 15.

**London**

*Greater London Council*

Barking L.B. No. 11, Barnet L.B. No. 2, Bexley L.B. No. 6, Brent L.B. (No. 2, Kilburn), Bromley L.B. Nos 2 and 3. Enfield L.B. No. 13, Haringey L.B. (Tottenham No. 6) (Hornsey No. 8) and (Wood Green No. 9), Harrow L.B. No. 11, Hillingdon L.B. Nos. 1 to 3, Hounslow L.B. (Brentford and Chiswick No. 7) (Feltham No. 6) and (Heston and Isleworth No. 10), Lambeth L.B. No. 17 Lewisham L.B. No. 21, Southwark L.B. Nos. 17 and 18, Westminster L.B. (Harrow Road South)

**Local Authorities outside the Black Areas**

Cambridge C.B. No. 2, Crewe B. No. 3, Reading C.B. No. 10.

## NEW ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Tyneside and Wearside*

Hebburn U.D. Nos. 4 to 6, Newcastle-upon-Tyne C.B. No. 11, Tynemouth C.B. Nos. 1 and 2.

*Teeside*

West Hartlepool C.B. No. 5,

**Yorkshire**

*West Riding (North)*

Aireborough U.D. No. 20, Baildon U.D. Nos. 7 and 8, Batley B. No. 5, Brighouse B. No. 11, Horsforth U.D.

Nos. 22 to 24, Leeds C.B. Nos. 57 and 58.
*West Riding (South)*
Swinton U.D. No. 12.

**North Western**

*South Lancashire and North-East Cheshire*
Cheadle and Gatley U.D. No. 8, Dukinfield B. Nos. 9 to 11, Eccles B. No. 7, Farnworth B. (Plodder Lane South), Prestwich B. No. 7A, Stalybridge B. (High Street, Set Street, Hollings Street), Stretford B. No. 9, Worsley U.D. No. 4.
*Central Lancashire*
Brierfield U.D. No. 1.
*Merseyside*
Bebington B. No. 10, Ellesmere Port No. 7, Liverpool C.B. Nos. 22 and 23, Widnes B. No. 6.

**Midlands**
Derby, Nottingham and Chesterfield, Sutton-in-Ashfield U.D. No. 1.

**West Midlands**
Dudley C.B. Nos. 27 and 28, Halesowen B. No. 27.

**London**
*Greater London Council*
Barnet L.B. No. 3, Bexley L.B. No. 7, Ealing L.B. No. 26, Harrow L.B. No. 12, Lambeth L.B. No. 18, Redbridge L.B. Nos. 11 and 12, Wandsworth L.B. No. 1.

**Local Authorities outside the Black Areas**
Meriden R.D. No. 1, Rochester C.B. No. 3, Rugby B. Nos. 2 to 5, Skipton U.D. No. 4, Slough B. No. 10, Todmorden B. No. 5, Watford B. No. 5.

## SUMMARY OF SMOKE CONTROL PROGRESS

**As at 30 June 1966**

| (1) *Region* | (2) *No of acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage* of total black area acreage in the region so covered* | (4) *No. of premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage of total black area premises in the region so covered* |
|---|---|---|---|---|
| Northern .. .. | 20,075 | 16.0 | 88,150 | 15.9 |
| East and West Ridings .. | 99,520 | 26.4 | 348,840 | 29.9 |
| North Midlands .. | 24,520 | 9.1 | 90,080 | 17.6 |
| Greater London .. | 162,055 | 49.6 | 1,433,925 | 54.3 |
| North Western .. | 107,410 | 26.8 | 490,805 | 28.8 |
| Midlands .. .. | 50,350 | 20.2 | 222,045 | 21.1 |
| South Western .. | 5,050 | 19.2 | 18,105 | 12.2 |
| Wales and Monmouthshire | 45 | 0.01 | 650 | 0.2 |
| Totals (black areas) | 469,025 | 22.3 | 2,692,600 | 32.8 |
| Outside black areas (all parts) .. | 86,654 | | 298,729 | |
| Grand Totals .. | 555,679 | | 2,991,329 | |

*The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of a black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country.)

# Natural Gas Compared with Town Gas

## *Questions of Conversion—the Canvey Island Change-Over*

In order to understand the difference that the advent of natural gas could make to gas consumers in this country it is necessary to know one or two basic factors of its calorific, or heating, value and composition as compared with the manufactured town gas supplied at present.

The different composition of natural gas means that for a given volume it contains more heating value—thus giving rise to thoughts that it burns "twice as hot" or "twice as fast" as town gas. These ideas are incorrect. It is, however, true that, compared to the same volume of town gas, natural gas has approximately double the heating value.

Gas is sold in this country on the basis of its heating value and the standard unit is the therm, which corresponds to 100,000 British thermal units (Btu.). The amount of gas which must be burned to produce a therm of heat can be calculated from the calorific value of the gas. In the U.K. the average calorific value of town gas is 500 Btu per cubic foot. Thus, to produce a therm of heat, 200 cubic feet of town gas must be burned. The calorific value of natural gas can be taken as 1,000 Btu per cubic foot, though this may vary depending on the source, and from this it can be seen that only 100 cubic feet of natural gas need to be burned to produce a therm—half the volume of town gas.

The constituents of town gas are hydrogen, carbon monoxide, hydrocarbons (methane, propane, butane, etc.) and inert substances (carbon dioxide, and/or nitrogen, etc.). Natural gas normally contains little or no hydrogen and no carbon monoxide, being composed of the hydro-carbons, mainly methane, and sometimes containing one or more inert substances depending on the source. Indications about North Sea gas are that it is relatively free from all inert substances and is therefore largely composed of practically pure hydro-carbons.

Air is needed to burn any fuel gas, and for the release of a therm of heat about the same volume of air is required for either town gas or natural gas. This is why approximately the same temperatures are reached when burning the two types of gas under similar circumstances. However, it also means that the burner pressure of natural gas must be increased to ensure that enough air is drawn into the flame by the gas itself.

The fact that only half the volume of natural gas is needed to provide the equivalent heat content of town gas has the advantage that any pipeline system immediately has twice the capacity on conversion to natural gas.

Because of its different composition natural gas has different burning characteristics to town gas. This means that a change of burner design is necessary, and that, in the event of a change-over to natural gas, the burners of all gas appliances would need to be changed or modified. The new burners will not provide "twice the heat", or boil water "twice as fast" they will simply give similar performance to the present town gas burners.

When burning, for example, on a gas cooker, natural gas appears almost the same as the present town gas. Only an expert eye can detect that it is fractionally different in colour, but the housewife may notice that the flame does not seem to "stand up" as strongly as at present.

The new burner designs will vary from appliance to appliance as they do now, and though some may show very little change on present designs, others may incorporate a second ring of small flames. In appliances which have hidden burners the consumer will notice little difference. Space

*Canvey Conversion—In the Customer's Home. Two of the Board's fitters fix a converted cooker*

heaters, which at present give out a rosy glow, may look less bright though giving out the same heat as before conversion.

Pre-payment gas meters will have to be changed or reset. Apart from the possibility of the long-term advantages of cheaper sources of supply resulting in lower prices, the housewife will still be receiving the same value for the price she pays for her gas—because she is charged only for the heat she uses (i.e. the therm).

The constituents of natural gas have two main advantages for the user. Firstly because the gas found off Britain has a very low sulphur content, the "verdigris" copper sulphate deposits, sometimes noticed falling from instantaneous water heaters, will be virtually eliminated. This will greatly assist maintenance and servicing. Secondly, being free from carbon monoxide, natural gas will help to eliminate the number of gas poisoning cases—though the vitiation problem, caused by a room not having sufficient ventilation, will still exist.

### The Canvey Island Conversion

Britain's first major conversion of gas appliances to natural gas consumption is now well on the way to completion. The task has been carried out by the North Thames Gas Board, and has involved some 7,000 domestic, 164 commercial and 20 industrial consumers and more than 22,000 appliances and the scheme is likely to set the pattern for the conversion of the rest of the country in the next decade.

The decision to convert Canvey Island was taken by the Board, in consultation with the Gas Council, towards the end of 1965, and was influenced by several important factors. The Canvey community occupies a small, self-contained area and has a very rapidly increasing demand for gas. Canvey is also the site of the Gas Council's reception terminal for liquefied natural gas imported from Algeria, and it is this gas which Canvey consumers will be burning.

The scheme would also provide very valuable experience in the techniques of conversion for the future. Very careful planning was necessary to ensure the fullest value from the operation.

One of the first necessities was to set up a base of operations. Several buildings were constructed on a site adjacent to the methane terminal to house administration, stores, workshops and a canteen for the staff.

A very detailed survey of all gas appliances on the island was started in February so that plans for individual conversions could be made. Customers were given the opportunity to replace old appliances with new ones at very attractive terms. The reasons for the conversion were explained personally to each consumer and the advantages pointed out—among them that gas tariffs would be reduced by 1d. per therm and that all conversion costs would be paid by the Board. At the same time the fitters required were going back to the classroom to learn the new techniques, and manufacturers were developing conversion kits and appliances for burning natural gas.

For the purpose of conversion the

island was divided into 24 sectors, each having about 300 consumers with about 900 appliances. Each sector was capable of being isolated from the existing gas mains system. The operation was planned so that one sector could be converted from town gas to natural gas in one day, and that a minimum of inconvenience was caused to consumers.

At 8 a.m. on 1 June, 250 fitters moved into the first sector. Their first priority was to deal with cooking apparatus—so that no-one was left without the means of cooking. Most consumers were able to cook their lunch on the new gas the same day. Attention was then given to all the other types of appliance. To ensure smooth operation radio communications were set up, including walkie-talkie sets.

Many of the appliances could be converted where they stood, or in a mobile workshop just outside, but the survey had revealed that some would need to be removed to the workshops specially set up at the conversion base. Where conversion was a more difficult job, temporary appliances were installed in the consumers' premises until the original could be returned.

After all premises had been disconnected from the town gas supply, the mains were then cleared of town gas by blowing the gas to the atmosphere, the town gas being forced out by the ingress of the natural gas at higher pressure. At this time, pre-payment meters were reset, and governors fixed where necessary to cope with the higher pressure of the natural gas.

## *AIR POLLUTION RESEARCH*

Mr. Peter Shore, Joint Parliamentary Secretary to the Ministry of Technology, recently visited Warren Spring Laboratory at Stevenage where air pollution is one of the subjects studied. At the conclusion of his visit Mr. Shore said:—

"Air pollution is one of the great problems of modern urban life. It costs the country the enormous sum of £350 million a year. This figure includes of course damage to buildings and materials, and ill-effects on health. It would be higher still but for the progress made in tackling air pollution from industrial sources and in establishing smokeless zones. The total tonnage of smoke poured out in this country in 1938 was around 2.7 millions; by 1964 it had been more than halved. Today most of it comes from houses rather than factories.

"Getting rid of smoke from house chimneys makes a big difference to urban areas. In London it has been shown that smoke control can reduce pollution in a residential district by half or more. When combined with redevelopment as in the East End, reduction to one-third has been possible.

"Warren Spring Laboratory has helped us both to understand and prevent air pollution. The Laboratory has developed measuring equipment which has been accepted throughout Europe. Research by the Laboratory into the ways in which smoke and fumes are dispersed in the air is expected to influence the future design of chimneys and buildings and the planning of towns. All this work has been achieved at a cost of only £190,000 a year.

"Road vehicles too present a sizeable pollution problem, although, fortunately, we cannot yet compete with California. Oddly enough the problem is not the heavy diesel vehicles which make the bystander cough and splutter. It is the less obvious carbon monoxide exhaust from ordinary motor cars. Petrol driven motor cars emit 6 million tons a year of carbon monoxide. In work on this Warren Spring Laboratory is co-operating with both the Motor Industry Research Association and with the Medical Research Council in assessing the possible hazards to health."

# Clean air is automatic with clean electricity

**For clean air areas the most natural choice is clean electricity for all home and water heating. Electricity is the only fuel that causes no combustion in the home at all. Always there to be switched on. Nothing to store. Nothing to dispose of.**

### THREE ELECTRIC CENTRAL HEATING SYSTEMS TO CHOOSE FROM

Electric central heating is automatic, simpler and cheaper to install than other systems. One of them is bound to be suitable for a particular house. All run on half-price electricity. All, of course, comply with the Clean Air Act.

**Floorwarming:** Cheap to install at construction stage in new houses, built into the floor. Easily controllable, and economical to run.

**Electricaire:** Warm-air central heating with one thermal unit and ducts built into the fabric of new buildings, controllable room by room.

**Storage radiators:** The most easily installed and practical system for existing houses. Cheapest system of any to install. Wide variety of storage radiators to choose from.

### WATER HEATING, TOO

Electric water heating is extremely economical when a correctly installed immersion heater, or self-contained water heater is used. Various types are available, suitable for whole-house systems, or single-room installations. Your local Electricity Board will be glad to give any advice on heating problems caused by the Clean Air Act. Ask them for a copy of the free leaflet 'Smoke control areas . . . how electricity can help'.

ISSUED BY THE ELECTRICITY COUNCIL, ENGLAND & WALES

# CONTRIBUTIONS TO CLEANER AIR

## *Industrial and Commercial News*

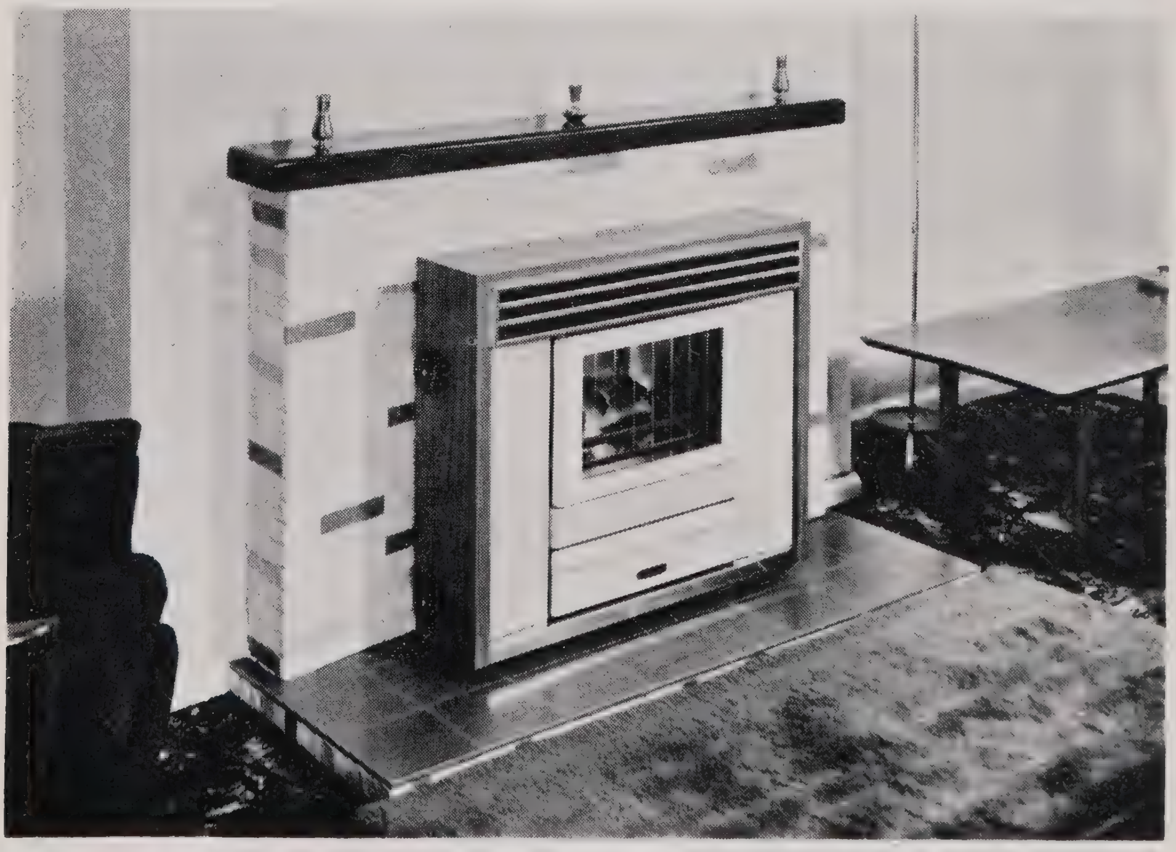
**"Furniture Finish" Roomheater**

We illustrate what is described as the first fully approved solid fuel roomheater that is in a genuine furniture finish. It is the Sunbeam "Royal", manufactured by Chatwins Ltd. of Tipton, Staffs.

The Woodgrain finish is a new material with which any known furniture woodgrain can be reproduced. Initially the heater is being supplied in natural teak, rosewood, and sapele finishes. The reproduction is remarkably good, and the general appearance of the heater is most pleasing.

A feature is that the front can be easily replaced, at small cost, any time a user wishes for a change. Thus a solid fuel appliance comes into line, design-wise, with other heating appliances, and this could materially help forward the much-needed change from old, inefficient heating, to the modern and efficient. The emphasis on appearance should not of course be at the expense of functional efficiency, and here the heater seems to meet the bill in every respect. One feature is that the more frequently used controls, such as primary air control, boiler damper, and bottomgrate shaker, remain cool and are therefore hand operated.

The Sunbeam "Royal" does differ drastically from the traditional conception of a solid fuel appliance but full advantage has been taken of long experience in the industry, specific features being—a rotary bottomgrate for ease of shaking; large and unusually robust ashpan; compensating adjustment on hinges; the provision of a flue restrictor for increased efficiency if the firedoor is open; an exclusive means of flue adjustment in



*The new "Sunbeam Royal" furniture-finish roomheater for solid fuel, described above* order to provide wider scope in surround or background design; easy means of chimney sweeping without any form of structural dismantling and constructional principles permitting the simple replacement of all components subject to wear or deterioration.

The Sunbeam "Royal" is a fully Approved Appliance and will be available through the N.C.B. Housewarming Plan in the normal manner. Retail price £55 12s. 6d.

### Gas for Steam Raising Exhibition

On May 24th a new exhibition was opened by the North Thames Gas Board at their Townmead Road, Fulham, premises. This exhibition features many examples of the latest in gas-fired steam boilers and has been arranged by the Board's Industrial Division, a specialist organisation which advises and assists industrialists.

The Division has held demonstrations and exhibitions at these premises for the past two years, including last year a very successful Factory Heating Exhibition.

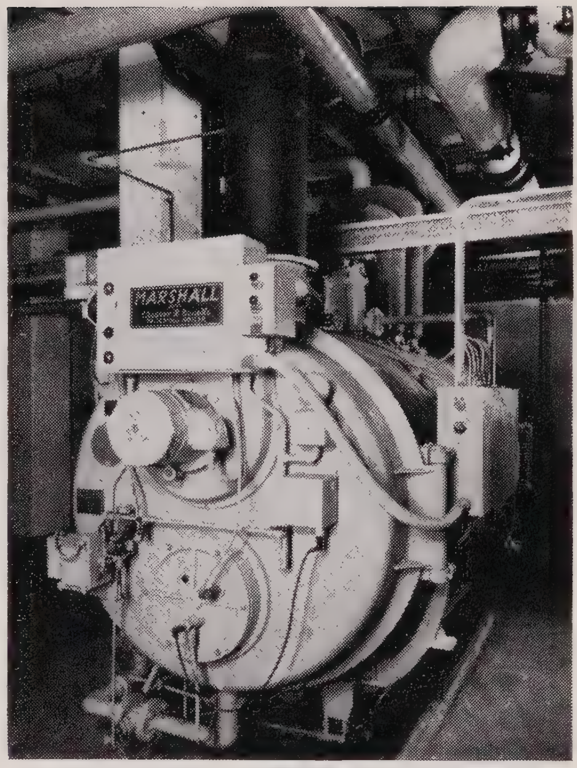
The purpose of these displays has been to bring together, under one roof, an extensive array of the equipment available to industrial and commercial gas users, so that they may be shown the choice open to them.

This new exhibition does just that for the steam engineer.

Almost every type of boiler design is to be seen at the Exhibition, such as vertical fire tube, horizontal shell with up to four gas passes, water tube and once-through water coil generators. They range in size from 20 lb. of steam per hour to 3,000 lb. per hour, although much bigger models could have been exhibited if space permitted.

A particularly valuable feature is the ability to produce steam from a number of the boilers on show. They can be demonstrated to show ease of ignition, safety and convenience of gas, speed of steam raising and novel design features.

The Board's staff and the manufacturers will be inviting customers and their professional advisers, to visit the Exhibition, which is planned to run until the end of the year.



*A Marshall CB 60 gas fired automatic boiler, rated at 2,070 lbs. steam/hour, supplies hot water for both heating and domestic use at the Rutherford College of Advanced Tehcnology Hostel, Newcastle-upon-Tyne. The Hostel, which is eleven storeys high and accommodates 130 students is the first phase of a two part project and was designed by the City Architects Department. The makers, Marshall Sons & Co., Ltd. of Gainsborough, Lincs, is one of the firms exhibiting at the "Gas for Steam Raising" exhibition described above*

It will open from 9 a.m. to 5 p.m. on weekdays and guides will be on hand to make each visit both interesting and beneficial.

The address is Imperial House, 195 Townmead Road, Fulham, S.W.6. and any interested member of the public will be most welcome, preferably by appointment. Appointments can be made in writing, or by telephoning Mr. D. W. P. Freeman of the Industrial Division on RENown 1212.

### Eliminating Industrial Smells

An ingenious method for stopping smells from a waste collecting pit has been developed by DEA-Scholven GmbH, an oil refinery near Karlsruhe

*Allplas plastic balls, three layers deep, effectively contain smell from the pit but afford sufficient ventilation to eliminate explosion hazard*

in Germany. They have covered the oil-water mixture draining into this pit from all parts of the plant with a triple layer of Allplass plastic balls, supplied by the German agents of Capricorn Industrial Services Ltd., 49 St. James's Street, London S.W.1.

The refinery is located in an area which has hitherto not been faced with any appreciable industrial smoke or smell problems In an effort to eliminate potential sources of smell from the refinery, all oil waste (even drips from pump glands and rain water) are washed into an extensive drainage system, which empties into a collecting pit. From there the oil-water mixture is taken through an extensive purifying plant to separate the oil, which is returned to the process, from the water, which is returned perfectly clean to the river Rhine flowing alongside the plant.

Despite these precautions, complaints about smell continued to be made. The smell was traced to a collecting pit. This pit could not be covered because of the danger of explosion from fumes which would collect under the cover. The Allplas 'blanket' has completely solved the problem, no complaints having been received since the balls were applied as shown in the photograph.

Because of their spherical shape, the balls nest in uniform layers over the whole exposed liquid surface, automatically giving way and reforming as the liquid level rises and falls over several outfall pipes. At the same time, the balls can never form an air-tight closure on the surface, so that they act like a flexible vented lid.

Allplas balls have been available for about three years now as 'blankets' on heated process tanks, to reduce heat losses by 69 per cent and evaporation by 88 per cent (test figures established by the National Engineering Laboratory of the Ministry of Technology). Their use as a means to combat industrial smells is new and opens up possibilities in many industries, especially since the polypropylene of which they are made remains unaffected by most chemicals. Plastic ball blankets may thus well become a simple means of meeting the increasingly stringent requirements of the Clean Air Act.

**Gas Analysers**

We have received details of the atmospheric analysers used for determination of ozone, sulphur dioxide and nitrogen dioxide, manufactured by Atlas Electric Devices Company, of Chicago, U.S.A. The sole U.K. agents for this equipment are Stanhope-Seta Ltd., of Park Close, Englefield Green, Surrey, from whom a descriptive bulletin may be obtained on request. Two different models are available for the continuous monitoring of concentrations of $O_3$ and $SO_2$. The range is adjustable from 5 pphm/v to 5 ppm/v, and differences of 0.1 pphm/v can be detected. The iodometric method of analysis is used, which is based on the quantitative release of iodine in a sodium iodine solution by ozone and a corresponding reduction of iodine by sulphur dioxide.

The $NO_2$ analyser is a separate apparatus, using as its basis a modified

Griess reaction (Griess-Schulze reaction) which involves the reaction of sulphanic acid with $HNO_2$ to form a diazotized sulphanic acid. This reagent is further reacted with a naphylamine derivative to produce a pink dye. A full colour reaction is obtained in 90 seconds. The range is adjustable from 10 pphm/v to 10 ppm/v.

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### Reducing Radiator Heat Loss

Baco Foil is being used by Thermaseal of Hillside House, Friern Park, London, N.12. as a radiation shield behind panel type radiators to stop the heat which is normally lost into the walls of a building.

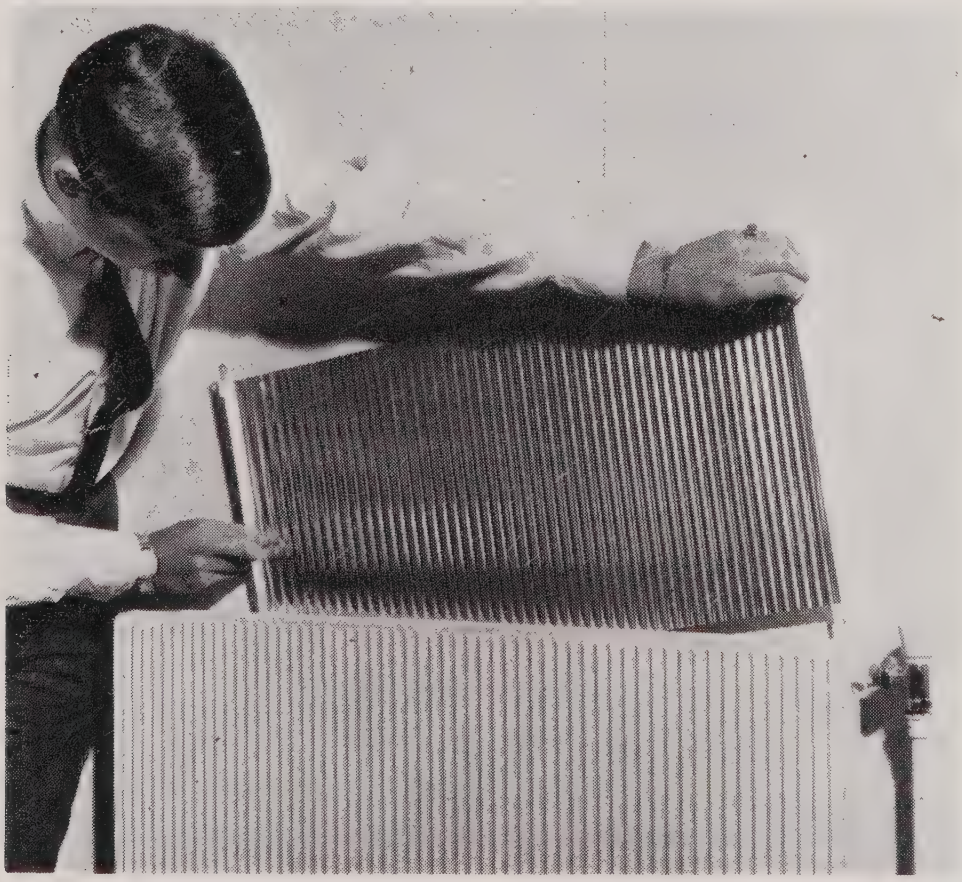
The Thermaseal aluminium foil shield reflects the heat away from the wall and increases the available heat from a radiator by up to 20 per cent. Savings of up to 15 per cent on fuel bills can be expected and the shield also greatly reduces wall discolouration.

Corrugated to give the maximum reflective area, the Thermaseal shield is made of 0.040 mm. hard temper Baco Foil manufactured by Aluminium Foils Limited of Thorn House, Upper St. Martin's Lane, London, W.C.2. There are steel rods at each end of the foil and specially designed fixing clips are supplied to fit any radiator. The Thermaseal is attached either horizontally or vertically depending on the radiator mounting, and is invisible in use.

The wholesale price of this simple and practical method of overcoming heat loss is approximately £1 14s. 0d. for a 48″ × 30″ radiator.

### Chimney Corrosion Tested by Ultrasonic Survey

The results of an independent ultrasonic research test recently carried out by Material Measurements Ltd., London on the inner skin of a three-year-old Dribore chimney installed at the works of J. & E. Hall Limited, Dartford, revealed that wear-down due to corrosion or other factors during



*The Baco Foil Radiation Shield being fitted* the three years' operation was negligible.

Acid corrosion and smuts are caused if the temperature of the flue gases falls below the sulphur dewpoint (275/283 deg. F.) In the chimney in question, the flue gas inlet temperature is 360 deg. F. The Dribore chimney is 120 ft. high, 2 ft. 10 in. diameter and is free-standing and self-supporting.

The inner skin of the chimney is constructed of mild steel plate having an original thickness of 0.1875 in. with a rolling tolerance of ± 0.010 in. Ninety-six measurements were taken in annular bands throughout the length of the chimney and the minimum thickness recorded in any part of the chimney was 0.155 in., where it is reasonable to assume a loss of 0.022 in., in the three years' operation. The average thickness recorded was 0.170 in. showing a possible loss of 0.017 in. but allowing for possible rolling tolerances, this could be as little as 0.007 in. or as much as 0.027 in. The minimal corrosion recorded, therefore indicates that acidic action, which can normally be expected with a metal chimney, not only did not occur to a degree which would be a cause for concern, but was so slight as to be dismissed as negligible.

Double-skin Dribore chimneys are patented design manufactured by Thermotank Limited, of Glasgow. Their construction consists of an inner and outer casing with $\frac{5}{8}$ in. separation, which is packed with corrugated aluminium foil insulation. This method of insulation prevents the temperature of the flue gases falling below the sulphur dewpoint during their passage through the chimney, under normal operating conditions, thus obviating acid corrosion and acidic smut emission.

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## Air Filtration

An interesting new development in Air Filtration comes from Canada resulting from an original invention by the Goodyear Tyre Company and now developed and marketed by the Pliotron Corporation of Canada.

The important feature of the filter is that it can be automatically cleaned and backflushed with water in situ by means of a travelling spray pipe, which sprays water under pressure onto the filter.

The filter media is a specially developed Polymer of shredded Polyethlene coupled with Dynel and Nylon which has particularly strong electrostatic properties. The current of air through the filter generates these electrostatic properties and causes particles to adhere to the surfaces. Large particles adhere individually and smaller particles agglomerate in the passage through the filter and adhere as a mass to the filter media.

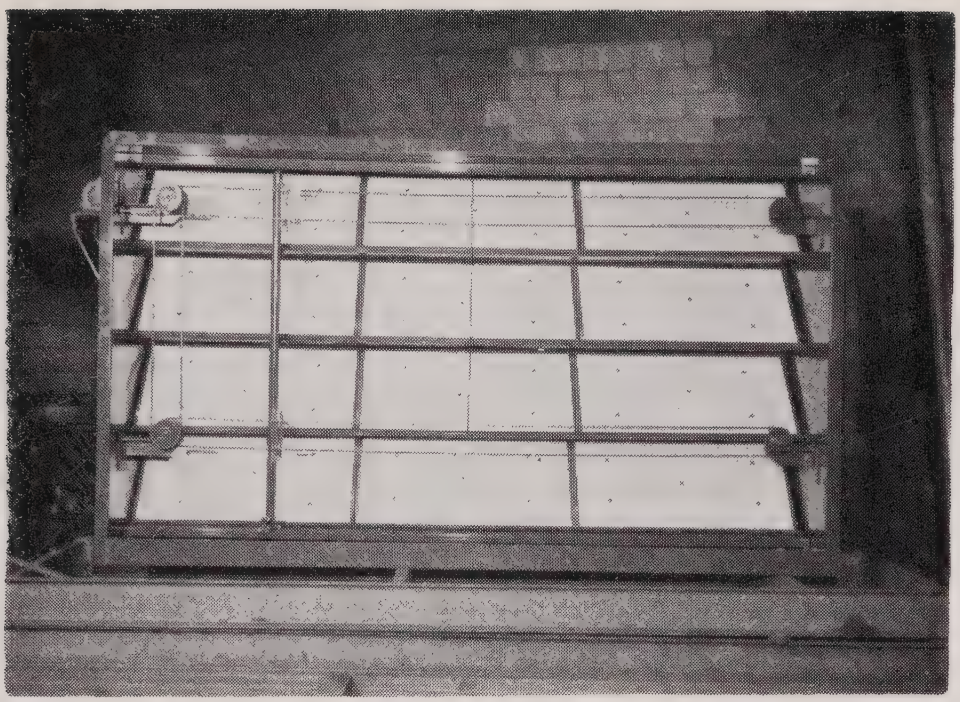
When resistance builds up, or on a regular time basis, the washing cycle automatically cuts in for the cleaning operation which will take about twenty minutes.

The advantages of the Pliotron filter can be resolved as follows:—

(1) Automatic cleaning of the filter resulting in extra efficiency due to removal of the human element in changing or cleaning of filters.
(2) Negligible running costs—as the filters are virtually non-expendable, no replacement of filters—no labour costs—very low electrical costs.
(3) Better filtration by virtue of Pliotron's ability to arrest sub-micron particles down to 0.1 micron and less.
(4) No dust loads released from filter media at time of changing.
(5) Elimination of great variance in air velocity as pressure drops through the filter bank builds up with loading.
(6) No more smoke or fire hazard from the filter banks. Automatic systems coupled to smoke detectors or when heat reaches 140°F can be arranged to shut down fans and sprinkle filters.

*Economics*

The economics of the Pliotron filter are impressive, particularly in the operating costs. These are extremely low—no labour for cleaning, no media or oil to change. The only cost is for water and electricity for the motor to drive the travelling washer. By contrast



*A typical Pliotron Air Filter, showing the travelling water spray for automatic cleaning*

all other filtration systems regardless of initial capital cost will continue to have high running costs throughout the life of the facility. Capital cost of the Pliotron are favourable compared to many conventional filtration media.

An interesting independent survey has been made in the use of Pliotron filters to remove pollen from air in hospitals to give relief from hay fever etc. These tests indicate that Pliotrons removed on average 98.6 per cent of pollen and brought considerable relief.

The applications of the Pliotron filters are infinite and successful installations have been made in steel mills, hospitals, computer rooms, electronic control rooms, instrument and assembly areas, offices and hotels.

The first automatic installation was made in 1962 as a prefilter to an electrostatic precipitator. The location was in a steel mill laboratory where dust problems were unusually severe. A measure of the performance achieved was indicated when major cleaning and oil changes on the precipitator were extended from a cycle of once every six weeks to once in fourteen months. More significant however, as the years passed has been the astonishing reliability of the system.

Since the initial installation units have been used in a variety of applications—office buildings, schools, hospitals, for industrial make up air, motor cooling and control and instrument protection. The largest single unit to date has been 150,000 cfm and the largest single order 1,350,000 cfm for twenty-seven 50,000 cfm units.

The Pliotron Corporation have an extensive organisation in North America and Europe. In Britain, Brian D. Croft Ltd., are distributors for Pliotron filters. Technical information in more detail may be obtained from them at 18, Queensdale Road, London, W.11. Telephone 01-727-5063.

## The Domestic Heating Society

This Society was formed in May, 1964, and up to its annual general meeting on 14 June last, had held ten meetings, the last being addressed by Lord Robens. The possibility of forming branches in Manchester and Scotland is under consideration. Readers interested in this new association and in membership should write to the Hon. Secretary, D. E. Pither, at 34 Mortimer St., London W.1.

# AIR POLLUTION ABSTRACTS

**863. Investigations of Sulphur Dioxide Pollution around a Modern Power Station.** By Martin A. and Barber F. R. (Journ. Inst. Fuel, July 1966, **39,** No. 306 294–307). Sixteen sulphur recorders have been sited around a modern 1,000 MW power station situated in a rural area. The recorder layout was in the form of a ring, the radius of which was the distance of calculated maximum ground-level pollution. The results from their operation during the period October, 1963, to September, 1964, are reported. On a long term basis the overall average effect of the power station on the concentration of sulphur dioxide as measured at these sites was small (0.1 to 0.2 pphm.) compared with that already to be found in the area (3 to 5 pphm.) Most of the pollution appeared to come from distant cities and industrial areas. The most persistent effect from the power station, amounting on average to only 0.6 pphm., was to the north-east of the station and is thought to be due to the combined effects of wind frequency and strength in that direction. Short-term (3 min) power station contributions were often detectable, but under the dispersing effect of the wind, were not usually persistent at any one site. There was no significant pollution from the power station in stable atmospheric conditions, with or without fogs. The importance of dosage, as well as peak and mean concentrations, is discussed. It is shown that the power station pollution and background pollution are rarely additive, and that only the background has given rise to objectionable dosages. Modification to accepted methods of calculation are proposed, to account for absolute short-term maxima recorded.

**864. The Uptake and Release of $SO_2$ by the Human Nose.** Speizer F. E. and Frank, N. R. (Arch. Env. Health, June 1966, **12,** No. 6, 725–728). Measurements were made of the absorption and desorption of sulphur dioxide in the upper respiratory tracts of seven healthy men breathing by nose. Virtually all of the inspired sulphur dioxide was absorbed by the nasal mucosa. It was not possible to saturate the system during the period of study at the concentrations used. During expiration sulphur dioxide was desorbed from the nasal mucosa in quantities which totalled approximately 15 per cent of the original concentration inspired. An implication of this study is that chemically minute amounts of sulphur dioxide (less than 1 per cent of the inspired concentration) are, upon reaching the larynx and more distal airways, sufficient to initiate reflex changes in bronchomotor tone.

**865. Biological Effects of Atmospheres Contaminated by Auto Exhaust.** Hueter, F. G. et al. (Arch. Env. Health, May 1966, **12,** No. 5, 553–560). The chronic exposure of experimental animals to various concentrations of irradiated and non-irradiated auto exhaust-air mixtures resulted in significant biological effects indicating the following: irradiated auto exhaust (1) increases the susceptibility to pulmonary infection and chronic disease during the latter half of the animal's lifetime, and (2) markedly decreases mouse fertility and decreases the survival rate of infant mice; both raw and irradiated auto exhaust cause a stress and adaptation response in mice as measured via spontaneous activity, increases bone lead concentrations, and increases the amount of nonfunctional or abnormal lung tissue. No experimental atmospheric effects were observed concerning: mortality; histopathology; growth-bodyweight; immunology; hematology restricted to erythrocyte count, erythrocyte cell size distribution, hematocrit or hemoglobin concentration; blood $O_2$ and $CO_2$ values; oxygen consumption; or pulmonary function in relation to permanent impairment. Further studies are indicated to elucidate more fully the affected biologic parameters.

**866. Some Comments on the ''Illnesses of Limestone''.** (In French) Raymond, V. and Nussbaum R. (Poll. Atmosphérique, April–June 1966, **8,** No. 30, 164–175). The acid atmosphere of our cities is speeding up the weathering of limestone by displacement of carbonates by rain charged with $CO_2$, followed by surface sulphation, and lastly, damage caused by microbic action. This last mentioned action is always accompanied by humidity and is very complex. Firstly the sulphates, formed in the ground by rain water charged with $SO_2$, are transformed into sulphides and hyposulphites (Pochon) by the action of sporo-vibrio sulphate reducers. These salts, carried by capillarity, are then transformed into sulphates by Thiobacteria. The sulphate crystals, larger than the carbonate crystals, cause the evolutive erosive damage.

**867. Emissions of Polynuclear Hydrocarbons from Automobiles and Trucks**-Hangerbrauck, R. P. et al. (A. Ind. Hyg. Ass. J., Jan/Feb. 1966, **27,** 47–56. (W.S.) As part of a screening survey to determine the origin of the benzo(a)pyrene found in urban atmospheres in the United States, emission rates of several polynuclear hydrocarbons, including benzo(a)pyrene, were measured on several automobiles and trucks powered by gasoline engines. The vehicles were road-tested over typical driving routes. The total exhaust was sampled by passing it through a multiplate condenser followed by large high-efficiency filters. Operating and emission data are given. The combined effects of vehicle-model age and mileage on polynuclear emissions are discussed, as are the relationships between polynuclear hydrocarbon emissions and the emissions of other products of incomplete combustion.

**868. Chimney Emissions and Immissions: Standardization of Formulae for Estimation of Plume Rise and Ground-Level Concentrations.** (Int. J. Air Wat. Pollut., Apr. 1966, **10,** 301–302.) Working methods to estimate dispersion of pollutants in the atmosphere have been evolved in the U.K. Atomic Energy Authority Health and Safety Branch to provide “standard” methods which are recommended for use throughout the Authority. The choice of formulae for calculating plume rise due to efflux velocity and buoyancy is wide, but it appears that the formula of Bosanquet, readily applicable by means of Carey’s diagram (Carey, 1957) or Nonhebel’s book (1964) is most suitable for use as the standard. While there is indeed little reason for using any more complicated formulae than Sutton’s equations for calculating ground-level concentrations (Nonhebel, 1965), there are reasons for using Pasquill’s development of Sutton’s work as “the standard” method. Pasquill (1961) used further theoretical and experimental results to provide tentative statistical estimates of lateral and vertical spread of the plume; this enables a fairly rational allowance to be made for the wide variation in atmospheric turbulence which occurs in reality and allows an extension up to greater distances. Charts prepared from Pasquill’s data give ground-level concentrations for unit discharge rate in six weather conditions up to the considerable distances which are of interest with regard to plumes of effective heights of emission up to 250 m. (Bryant, 1964). There is evidence that these charts are already widely used both in the United Kingdom and outside it.

**869. Lung Cancer and Environment: A Study of Long-Term Exposure to Motor Fumes in Tunnel.** Kooperstein, S.I et al. (APCA) (J. Occupational Med. Dec. 1965, **7,** 626–9). No mortality or morbidity from primary lung cancer was found among a group of 97 retired tunnel police officers who had worked within the Holland and Lincoln tunnels, and had been in retirement at least 10 years, after 25 years of active service. No case of primary lung cancer was found among the 25 retired police officers studied who had died during this same retirement period. Among the 16 living nontunnel retired police officers included in this study, there is one with primary lung cancer successfully resected 11 years ago. The interval between initial exposure in the tunnels and the time of this study was at least 18 years and as long as 37 years; in 89.7 per cent the interval was over 30 years

**870. The Fading of Colouring Matters.** Giles, C. H. (APCA) (J. Appl. Chem. London, Dec. 15, 1965, **15,** 541–50) Many dyes are destroyed by acid gases in the atmosphere, especially by sulphur dioxide and oxides of nitrogen. Atmospheric fading in absence of light, is produced by nitrogen oxides in urban air, with blue and violet disperse dyes on some hydrophobic fibres, but $SO_2$ and ozone can also cause fading. Light fading occurs with all dyes. Some of the factors which affect it, including the physical state of the dye, the chemical and physical nature of the fibre, temperature and humidity of the atmosphere, and the quality and intensity of the illumination are discussed. The types of fading rate are described. 47 references.

**871. Determination of specific surface of dust by measuring gas permeability of filter surfaces.** (In German) Benarie M.M. et al.

(Staub-Reinhalt. Luft. July, 1966, **26,** No. 7, 298–301). A modification to the permeability method for measuring specific surface of dust is described. Whilst in the classical permeability cells several grams of dust are still required, a micromethod using only a few mg of dust is considered here. The method has been developed specially for suspended dust. After depositing dust on a filter paper information on its specific surface may be obtained in less than one minute.

**872. Contribution to Sulphur Removal from Waste Gases.** (In German) Klimecek, R. et al. (Staub-Reinhalt. Luft. June 1966, **26,** No. 6, 235-238). The problem of waste gases containing sulphur dioxide is discussed. In Czechoslovakia, the so-called wet methods are proposed for desulphurization. The following methods were tested: soda and zinc method, the well-known modifications of the ammonia method and the so-called catalytic oxidation of $SO_2$ in liquid phase. Particulat attention is paid to the absorption process. A recently developed absorption apparatus can be advantageously used for diluted gas mixtures.

**873. Particle Size Analysis.** Scarlett, B. (Filt. and Sep. May-June 1965, **2,** (3), 215–222. A sub-committee of the Society of Analytical Chemistry recently classified 74 methods of particle size analysis and is now assessing them. It would seem that any classification is best done on the basis of the physical principles involved in the measurement, since this type of classification groups together the methods which measure the same or similar parameters of the particles. Many older methods are useless for measuring particles less than about 50 μ, but techniques for measuring the size of very fine particles are receiving increasing attention. It is the author's purpose to show how these methods are extensions of the techniques already needed for coarse powders, to discuss their development and to classify them in the same way.

**874. Air Pollution Abatement in the Ceramic Industry.** Bozsin, M. (Journ. of the Air Poll. Contr. Assn. June 1966, **16,** No. 6, 332–3) Air pollution abatement has been a constant concern for the ceramic industry over the last four decades. The multiplicity of materials involved, numbering in the hundreds of fluxes and refractories for the manufacture of many different types of glasses, results in gaseous as well as particulate reaction products. Methods of abatement through various means have been developed and are in use in the United States and world-wide today.

**875. Control of particulate emissions from a ferrous foundry.** Lysyk, M. V. Pap. 65–163 to 58th Annual Meeting, Air Pollut. Control Ass., Toronto, 20–24 June 1965. Dustfall and stack sampling surveys were carried out since 1959. In the fall of 1963, due to citizen complaints, a point was reached where the local health authorities became prepared to proceed to publish technical results made available. Stack sampling and dustfall, and oxide results are given. Slides are available of the crude chain set-up that was used at one time to knock out particulate matter, and the modern air pollution control equipment now in place. This plant represents a break-through in using a water wash set-up for controlling particulate emission from a foundry cupola stack. Approximately two to two and a half tons of sludge is removed every night since the installation of this control equipment.

**876. Urban Development in Air Pollution Basins—An appeal to the Planners for Help.** Arnold, G. and Edgerley E. Paper No. 66–34 to 59th Annual Meeting, Air Pollut. Control Ass. San Francisco, Cal. June 21, 1966. Urban areas are often covered with a pall of smoke because they were built in a topographic depression on a lake shore or along a river, where stable air restrains the atmospheric dispersion of contaminants. Air drainage into such a basin especially in the fall, or cooling of the surface air layer by cold water, is manifest in numerous local inversions. The effects of the concentrated and contained air contamination cause the urban area to be recognised as an air pollution basin. In air pollution basins, there are more fogs, more pervading odours, more soot and sulphur dioxide, more overcast conditions. These low-lying areas result in dingy houses, crumbling masonry, and stunted vegetation. How does one escape from a basin? Obviously, head for the hills! Here is where the planners can help —the fertile alluvial soil with adequate moisture for crops should be used for agriculture, while the higher ground of poorer quality is consigned to the acres of asphalt interlaced by concourses of concrete. The stronger winds at higher elevations should be put to good use. Place smokestacks on tops of hills, and their dispersion properties would be vastly improved.

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Room heaters have the fire enclosed behind glass, they burn slowly, economically (it's the cheapest form of continuous room heating there is) and efficiently. With a high output back boiler, they heat radiators round the house for room-to-room warmth and provide constant domestic hot water.

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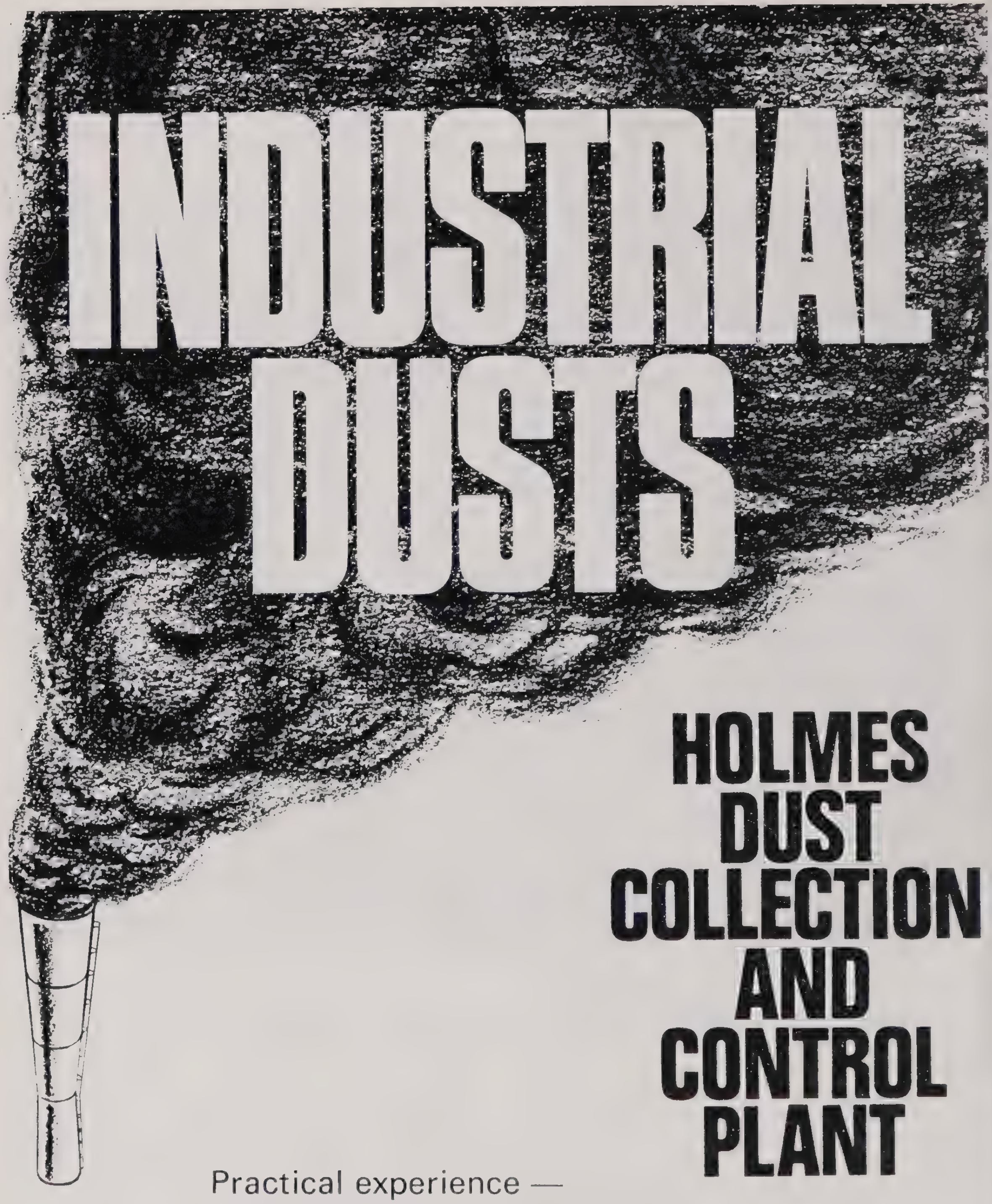

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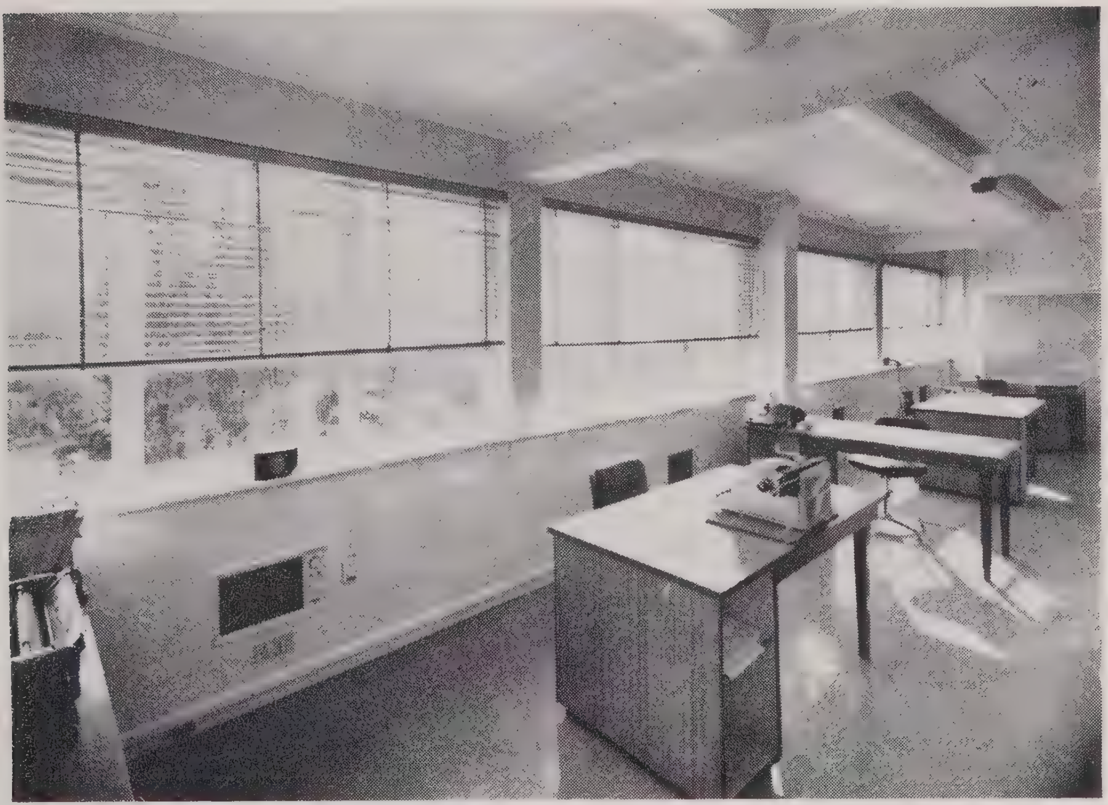

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CLEAN AIR

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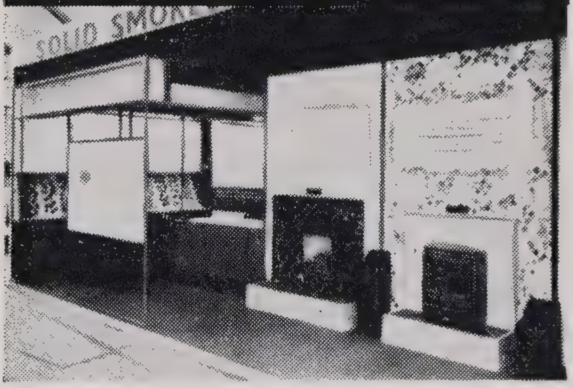

MOBILE EXHIBITION UNITS

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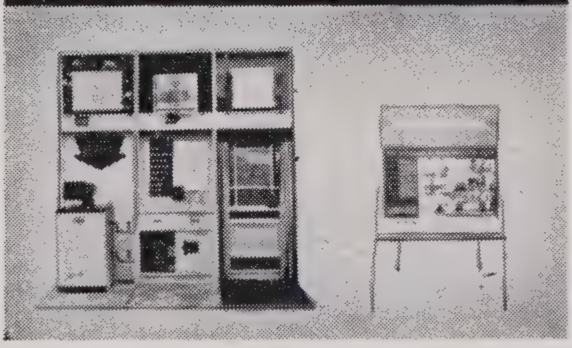
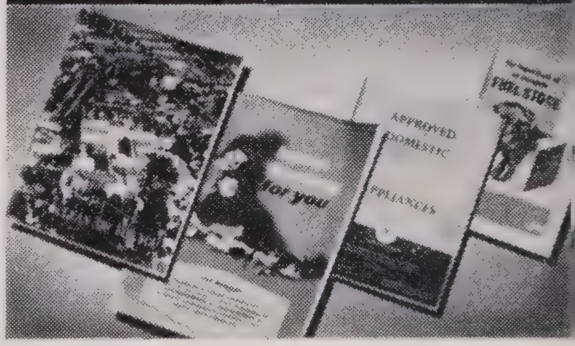
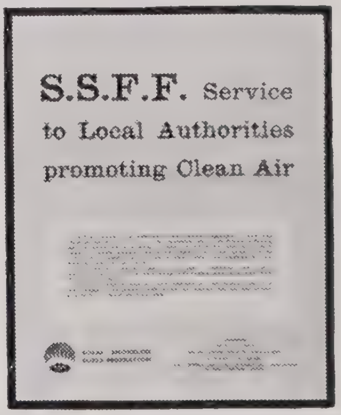


LITERATURE



Local Authorities establishing Smoke Control Areas or organising "Clean Air" campaigns, House Improvement or Conversion schemes should take full advantage of the technical advice and assistance offered free of charge by the Federation. Very many Local Authorities have been assisted with the Federation's static and mobile exhibitions, and portable display equipment. More than 1,000,000 copies of the booklet "Clean Air For You" have been supplied for distribution. This booklet has recently been revised to include details of changes in the conditions of grant and costs allowed under the Clean Air Act. *Copies of "Clean Air For You", "S.S.F.F. Service to Local Authorities promoting Clean Air" and "Home Heating For You" will be supplied on application to:*



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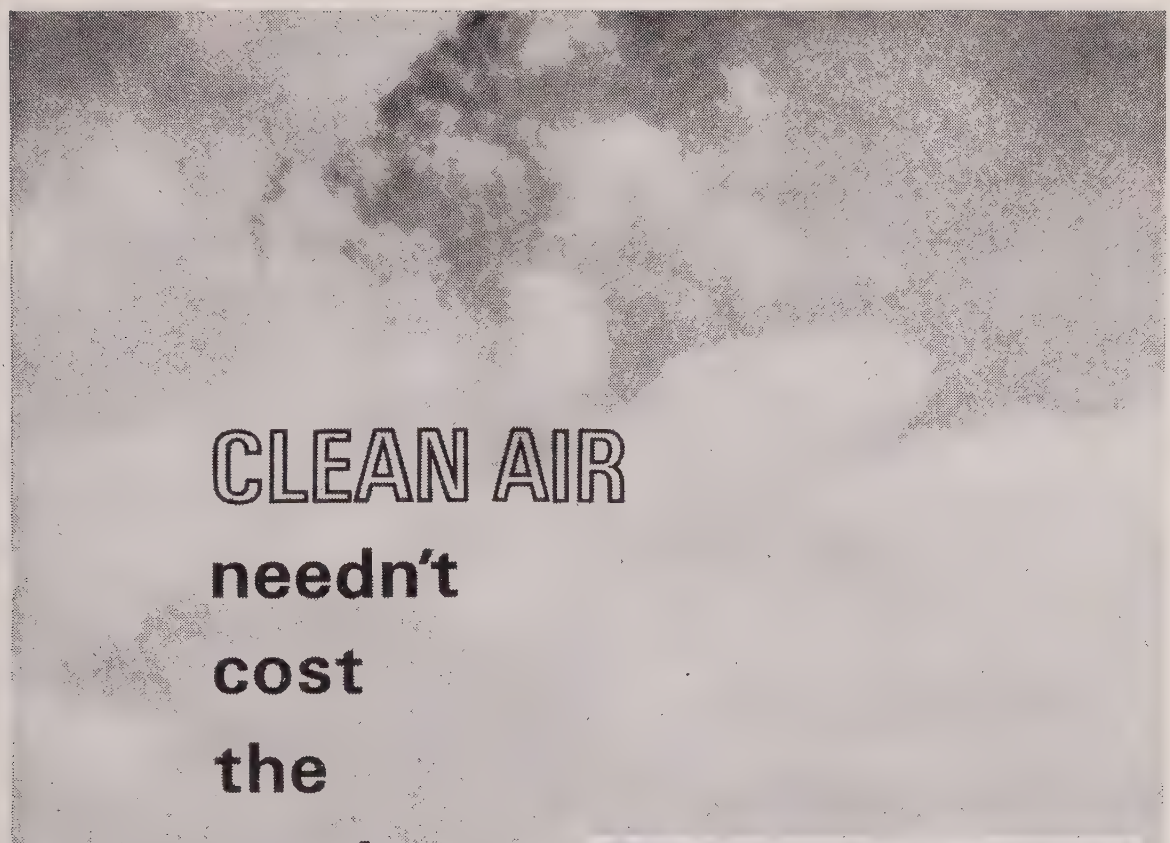

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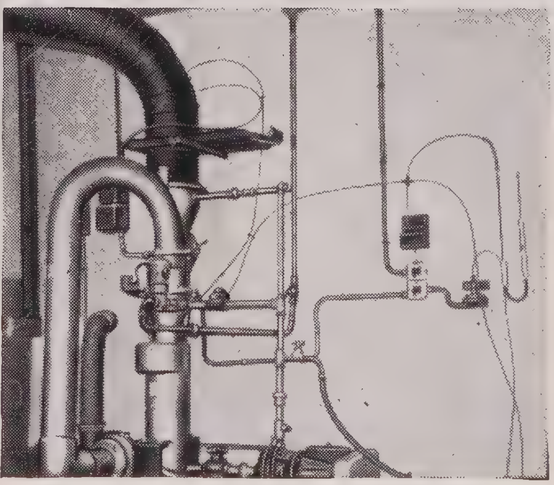

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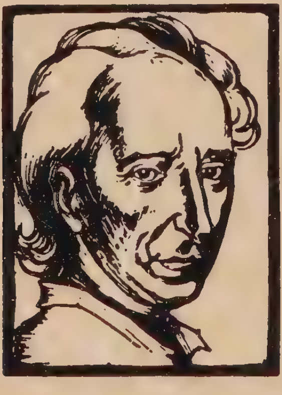
# SMOKELESS AIR

JOURNAL OF THE
NATIONAL SOCIETY FOR CLEAN AIR



No. 140 ⋆ WINTER 1966 ⋆ 3s.

*In this Issue*

International Congress Survey ★ Reports from the Fuel Industries
A Continuous Automated Incinerator ★ Electronic Petrol Injection System
Air Pollution Abstracts—Complete Set of London Congress Papers

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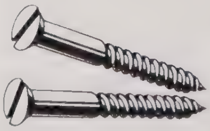

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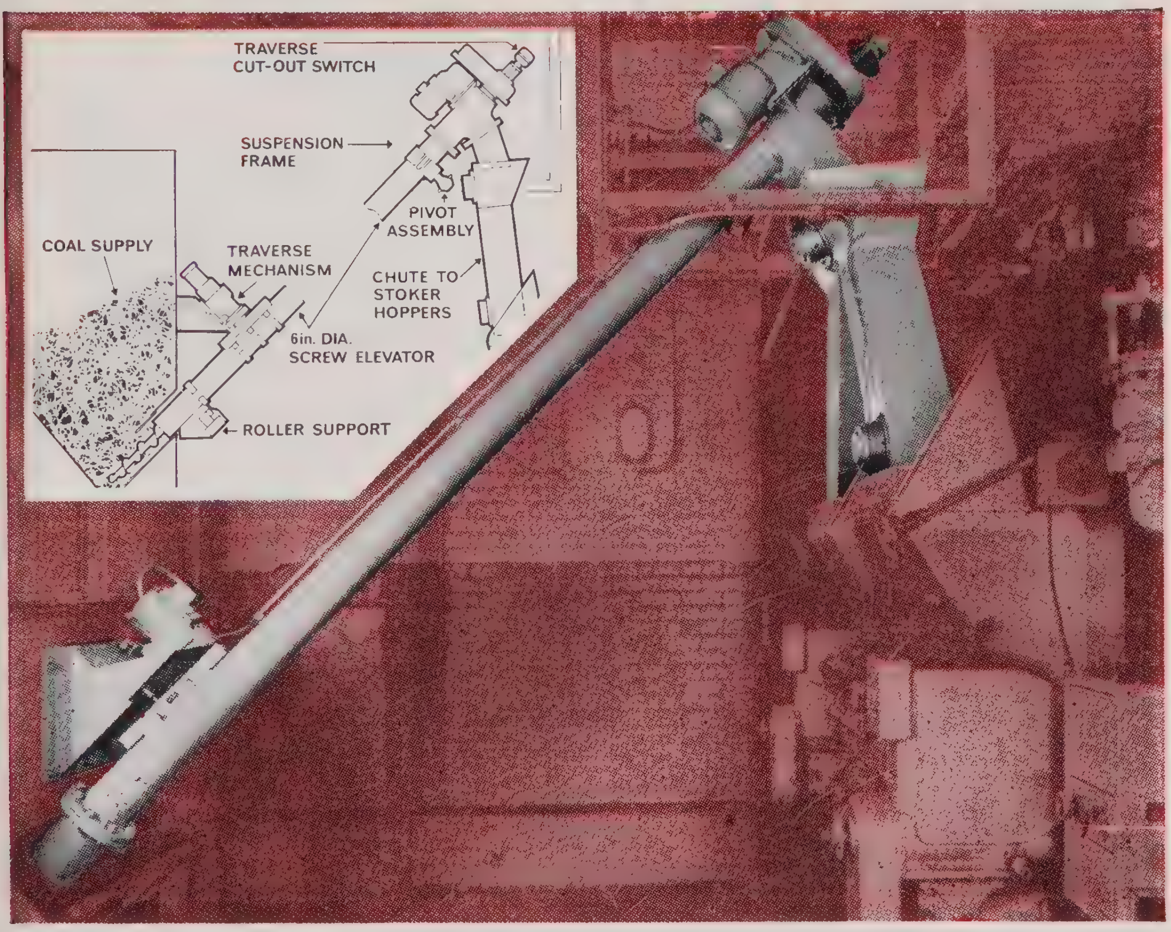

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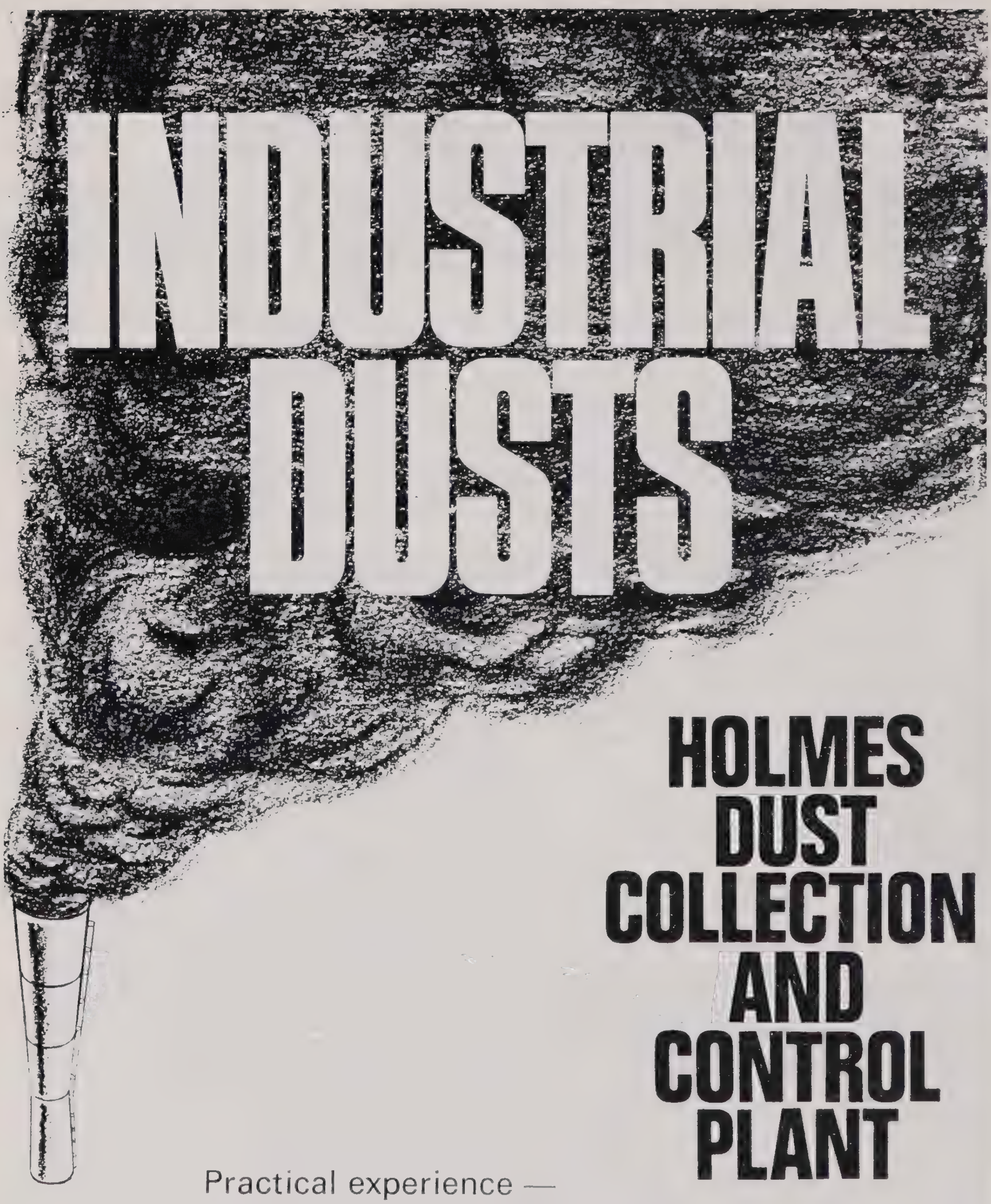

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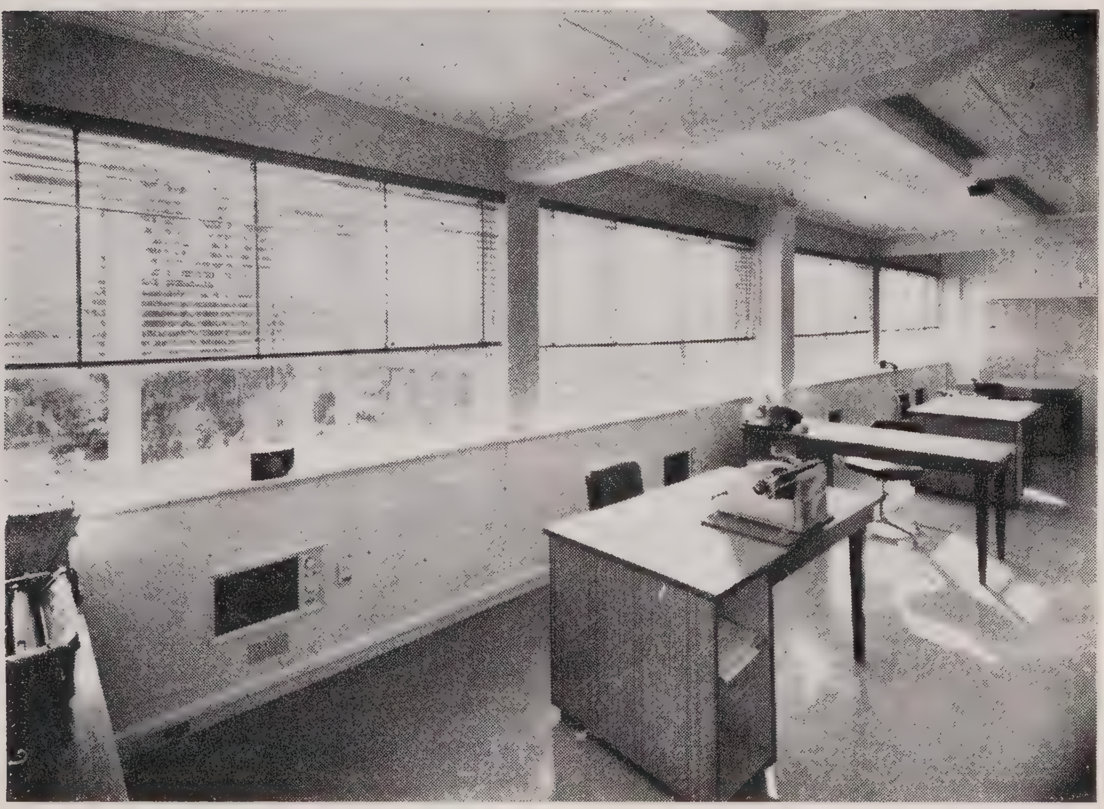

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*Illustrations showing the MH4 in an office and in the home.*

The Knightsbridge range of heaters have been designed for incorporation within a normal building structure. Alternatively, installations for internal walls of breeze block structure require a surface mounted surround.

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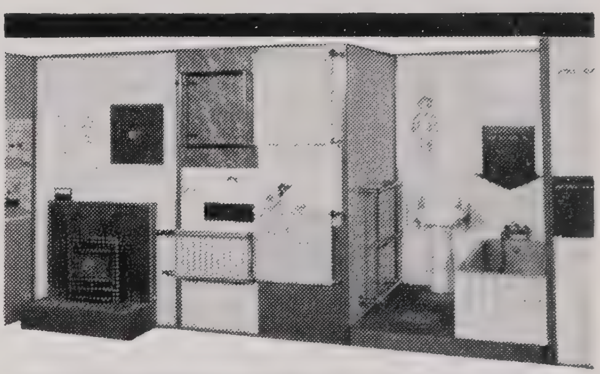

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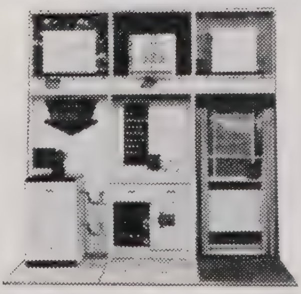
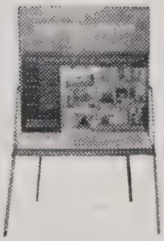
Manned with technical demonstrators, to advise and help residents in proposed or newly-formed Smoke Control Areas. They incorporate approved appliances under fire and a display of the solid smokeless fuels.

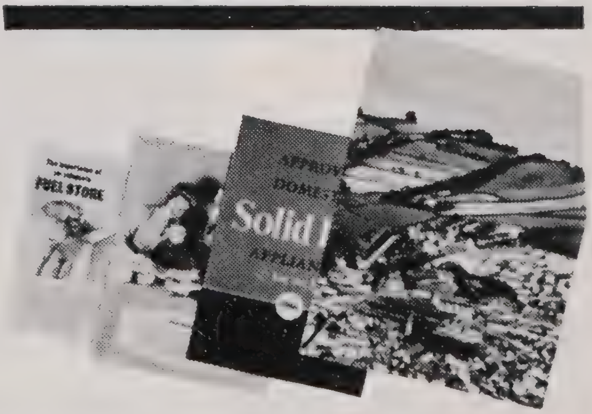
## DISPLAYS





A range of portable units variously displaying instructional panels dealing with Clean Air and the Act, a typical central heating unit, fuel displays and literature displays.

## LITERATURE



Informative literature is available free to Local Authorities explaining the Clean Air Act, and giving full information on solid smokeless fuels and the appliances.

Full details of S.S.F.F. Services and literature apply to:
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MEMBERSHIP of the Society is invited and is open to individuals, local authorities, firms and other corporate bodies. Full details and membership application forms will be sent on request.

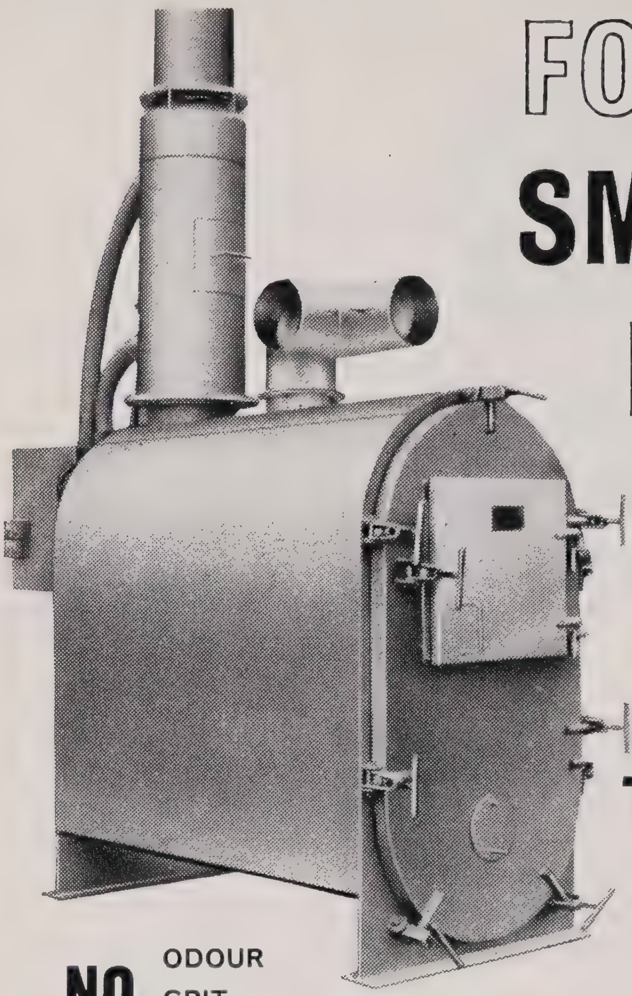
## *Forthcoming Events*

**Annual General Meeting and Luncheon–London, 2 May 1967**

**Annual Conference and Exhibition–Blackpool, 17-20 October 1967**

*International Congress Proceedings, Part II*

**See special announcement on page 92**



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Incinerator prices from £195

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# SMOKELESS AIR

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: CHAncery 5038 (Editorial and Advertising). Editor: Arnold Marsh; Asst. Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SMOKELESS AIR only, 12s. per annum, post free.

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*Ships, towers, domes, theatres and temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air.*

# SMOKELESS AIR

## The International Union

THE International Union of Air Pollution Prevention Associations, formed in 1964, has so far only six members. This small number follows from a decision that membership should be open only to non-governmental organizations of national standing. So far very few such bodies exist, but membership is likely to be increased by at least three in the near future. Consideration is also being given to the desirability of instituting a class of associate members, which which could include governmental or other official, and even international, agencies. It is too early to see how exactly the International Union is going to develop, and what activities it can usefully undertake other than the holding of an international congress every four years or so. What is certain, however, is that the recent Congress in London, organized for the Union by the NSCA, has done much to consolidate the foundations on which the Union is being built, and that it has in addition strengthened the links that have been growing during the past few years between all organizations, groups and individuals concerned with air pollution throughout the world. The fact that 32 countries were associated with the Congress, either by sending delegates or contributing papers, is proof of this. The friendly, co-operative atmosphere that grew during the week of the congress was most gratifying, and the Society can feel that its efforts to make a success of this inaugural gathering of the new Union were well worth while.

The Society took risks, both in striving to make the venture a visible success, and in financing it. The International Union has so far had no funds at all, no contributions were asked for from the other members, and the Society had to balance the need for a modest registration fee (too modest in the opinion of some) with the heavy expenses that were involved —including the rent for the hall, its decoration, even the hiring of the seats, the simultaneous translation service (which was excellently done) and the cost of printing a volume of Papers that proved to be more substantial than was earlier anticipated. But we can feel that the effort and the risk have been fully justified, and that the Society has made a sizable contribution to the global campaign against air pollution.

## Refuse Disposal

Just as the preparation of the contents of this issue was being completed, including the description of the projected automated refuse incinerator at Derby, we received a copy of a paper on the subject of incineration that was being read at the Public Works and Municipal Services Congress. This was on "Tests on Emission from Refuse Incineration Chimney Stacks" and was by A. E. Barton, General Manager of the Birmingham Salvage Department and E. J. Ostle, of the National Industrial Fuel Efficiency Service. We hope to give an account of it in our next issue, as it reinforces the foreword to the Derby article on the growing importance of this question to clean air.

If the burning of refuse becomes more common it will be necessary for those concerned with clean air to make sure that such installations can be operated, not only smokelessly, but without the emission of grit and dust or noxious gases. The paper mentioned above is largely concerned with tests made for noxious gases, and it points out the big changes that have taken place in recent years in the composition of domestic and trade refuse—a big drop in the cinder content and a big increase in paper and other putrescible material. Some of the changes are due to the changes in heating methods and the growing difficulty of disposing of much burnable material in the home, and some to the proliferation of packing materials.

In one important way refuse incineration links up with the renewed interest in district heating. If the heat from incineration, otherwise likely to be wasted, can be connected with centralized heating installations, the economics of both systems can be improved. This was stressed by N. S. Iversen, of Denmark, in his paper on this particular theme at the recent International Congress, in which he gave an example of what could be done by describing the combined district heating and incineration installations at the town of Herning.

It is an attractive proposition, but one difficulty seems to be that for efficiency a district heating plant must be close to the houses and other premises it is to serve, and therefore so would any linked incineration plant. This could cause air pollution problems, but it is something that should be more fully discussed.

## *The North West and its Environment*

In our Summer, 1966, issue we reviewed and discussed an American publication called *The Quality of our Environment*, by a Presidential Committee, and published from the White House. This looked at the environment as a whole, with clean air as one of the important aims. We asked if we in Britain should not do more to draw together all who are working for the defence of the environment, rather than continuing to work in isolation against the various kinds of pollution and other menaces that spoil or menace it.

It is therefore gratifying to find that a move in keeping with this idea was actually in train in the North West, where the Economic Planning Council had set up an Environment Committee. This Committee—under the chairmanship of W. L. Mather, an old friend and former Executive Council member of the NSCA—has published a valuable report, from which we quote on another page. We hope that the report will be taken to heart in the North West, where defence of the environment calls for urgent, vigorous, and far-reaching action. As in the American survey, the North West report looks at many environmental problems, with air pollution heading the list.

## *Inventions*

The achievement of clean air, either by new and better ways of using energy, or by means for preventing emissions, depends very largely upon inventions, both made and proved, and yet to come. We have been glad to learn more about the National Research Development Corporation, and to see the latest issue of its twice-yearly bulletin.

The NRDC is a statutory organization, existing to promote the adoption by industry of new products and processes invented in government laboratories, universities, and elsewhere, advancing money where necessary to bring them to a commercially viable stage. It does not itself manufacture or trade, nor does it have its own research or development facilities. It is an independent public corporation, not a government department. It does not receive annual grants but is financed by the Ministry of Technology with government loans, and is required to balance its account in the long term.

Since it was established, NRDC has had submitted to it some 12,000 inventions, of which over 800 have been licensed to industry. Most of the inventions are from government or university sources, but private inventions can be assisted if they are in the public interest.

The range of inventions that are available under licence is listed in the bulletin, together with a review of developments and news about inventions that have been licensed. Altogether a fascinating picture of technical advances that are helping British industry and the national economy. Among items of fuel interest in the current bulletin is a patent on the design of an insulated flue pipe suitable for domestic buildings; a multi-gas burner that by a simple change of injector nipple can be used for towns gas, natural gas, or liquefied petroleum gases; a "Hoverkiln" for the firing of ceramics; and (under investigation) a process for the hot pressing of ceramics.

We hope to give information from time to time about new inventions of interest published in future issues of the bulletin. This, by the way, is available free of charge to firms, libraries and the technical and trade press, but not to individuals. Inquiries should be made to the Corporation at P.O. Box 236, Kingsgate House, 66-74 Victoria Street, London S.W.1.

## Clean Air Not Frozen

Some local authorities have been anxious about their smoke control area schemes in the light of the Ministry of Housing and Local Government Circular 42/66, on "Public Expenditure". This asked local authorities to co-operate during the present economic "freeze" by cutting or deferring projects other than housing and similar urgent measures, so as to achieve as large a saving as possible during the current year. "A similar test of urgency", continued the circular," will be applied to other public health projects, such as burial grounds and crematoria, refuse collection, clean air and coast protection, though it is unlikely that substantial savings will be possible here".

We understand that the circular was not intended to reduce the rate of progress in smoke control, and it was for this reason that clean air had been placed in a special category with other services connected with public health. Many smoke control orders have in fact been approved since the circular was issued.

## The Year Book

Members and representatives will have received a copy of the new edition of the Society's *Clean Air Year Book*, 1966-67, with the last issue of this journal. Other readers may obtain copies at 3s. 10d. each, postage included. We regret the late publication —due to preoccupation with the International Congress—but hope that the new edition will be as useful for reference as its predecessors. Several new features have been included, including a table of cost limits for smoke control area grants, and a table extending the annual estimates of air pollution by Dr. A. Parker to include pollution from road vehicles. The NSCA section contains the annual report and accounts for 1965, and a list of subscribers for that year.

## Errata Dept.

Readers of the Year Book should note the odd misprint on line 14, page 26, where it is stated that a government report was revised in *Smokeless Air*. It was of course only *reviewed*.

An equally absurd misprint occurs on page 37 of the Congress Proceedings, Part 1., when in a list of references the omission of a 't' make the title of a paper appear as *Climate, Air Pollution and Morality*.

A more appropriate typing error, which we rather liked, was on the envelope of a recent letter to the Society, addressed to Fuel House, Breams Buildings.

# THE INTERNATIONAL CONGRESS

## A Survey

IT is not easy to judge the success or otherwise of an event such as the recent International Clean Air Congress in London, especially when looking at it from the centre. But, unless everyone has been over kind, the consensus of opinion appears to be that it was most successful in bringing together air pollution workers from all parts of the world, in providing papers and discussions of high quality, and in promoting personal contacts, leading to understanding and friendship, in a truly international fashion.

Many factors contributed to this: the support given to the NSCA, as host association, by the other member associations of the International Union of Air Pollution Prevention Associations; the remarkable (almost overwhelming!) interest that resulted in a volume of no less than 91 papers; the very hard work (much of it at the double) put into the organizing by all members of the Society's staff, well backed by the Congress and Exhibition Committee and other members of the Society; and those organizations whose generous hospitality provided the outstanding social occasions—occasions which we were glad to find delighted especially our overseas delegates.

The total number of registrations was 1,264, which is very close to the 1,251 who attended the Society's Diamond Jubilee International Conference in 1959. One important difference is that the number of delegates from overseas was 180 in 1959, whereas this time it was 340. This is an indication of the growth of world interest in air pollution over the past seven years—a change that was undoubtedly stimulated by the 1959 conference.

**The Sessions**

The sessions in the Old Horticultural Hall were of course the main reason for and object of the Congress. With the papers covering so wide a range of interest, not all of which could have appealed to everyone, it was remarkable how well-filled the hall was for each of the six periods. As those who were present know, the papers, up to 20 in one session, were not read, but were introduced by a Rapporteur, and were then open for discussion. The discussions varied in the number of speakers, and in some there was not time for every would-be contributor.

Both the Rapporteurs reports, and the discussions, with any replies the authors may wish to make, will be included in the Congress Proceedings,

*Photo above shows the Congress opening, with the Lord Mayor of Westminster speaking. Also at the front, left to right are J. H. Street, R. Pavenello, and Y. Queret*

*A general view of the hall during the opening session*

Part II, to be published as soon as possible in 1967. For many these reviews of the formidable array of papers, highlighting their more important features, will be the best and quickest way of obtaining a clear, full outline of the proceedings as a whole. The abstracts we publish in this issue give a brïef summary of each paper, but of course without comment.

The opening session was brief, with Sir Alan Wilson, F.R.S., in the Chair. The proceedings opened with an address of welcome by the Lord Mayor of Westminster, Councillor A. L. Burton, who also formally declared open both the Congress and the Exhibition. Then followed messages of good wishes from the Minister of Housing and Local Government, on behalf of H.M. Government, read by J. H. Street, and from the World Health Organization, read by R. Pavenello. A vote of thanks to the Mayor and the President was moved by Y. Queret, Secretary of the French member association of the International Union.

Session II followed immediately, with Sir Alan again in the Chair. The six continental reports were then presented by their authors. It was the first time that such a global review had been attempted, and the reports were extremely informative and valuable. They set the congress off to an impressive start.

The other sessions continued until Thursday afternoon, under the able chairmanship of Professor Roussel of France, Min.Dir. H. Stephany of the Federal Republic of Germany, Takahide Taga of Japan, Dr. Jose A. Rispoli of the Argentine, and Dr. C. E. Barthel, Jr., of the United States of America. They were supported by Vice-Chairmen, who were Professor Padovani of Italy, Dr. H. de Graaf of

*Part of the platform party, opening session, left to right are Dipl. Ing. H. Stephany, Prof. A. Roussel, Dr. C. E. Barthel, Arnold Arch, J. H. Huguet, Takahide Taga, Prof. P. C. G. Isaac*

*R. Pavenello reading the message of greetings from the World Health Organization. On his right: Y. Queret, France*

the Netherlands, Dr. Ing. R. Andrzejewski of Poland, Dr. W. Lindberg of Sweden, and Professor Dr. Dieter Högger of Switzerland.

Because there was limited time for the prior study of the papers, the Rapporteurs were all from the U.K. In the same order they were A. C. Saword, F. E. Ireland, Dr. A. Parker, Dr. J. S. G. Burnett, W. Bate, and Stanley Cayton. At the end of the last session a brief summing up speech—a sort of *vale*—was given by Arnold Marsh, speaking as Secretary of the International Union.

It was announced, during the Congress, that the committee of the International Union had met, and had agreed to accept an invitation from the American member, the Air Pollution Control Assocation, to hold the next International Congress in Washington in 1970.

### The Social Events

The cynic might say that the social events were put on just to give everyone a good time. They did that, it is true, and in good measure, but that is only part of their purpose. They provided the opportunity, that is quite impossible when sitting in rows facing a platform, for enabling old friendships to be renewed and new ones made; for giving opportunities for useful informal discussion; and for creating that sense of unity and common purpose that is important for any organization, and is vital for a young and inexperienced international body.

We are therefore deeply grateful for the generosity of all those who provided the hospitality that was enjoyed by all or by some on each of the four days.

First, on the Monday, the meeting of the Executive Committee of the

International Union was preceded by a luncheon that was given for them and the principal officers of the member associations, with a few governmental and other special guests, by the Esso Petroleum Company. Held at the Hyde Park Hotel, the occasion was presided over by Dr. A. W. Pearce, a member of the Board of the company.

Next, the early evening saw a Reception at Lancaster House for overseas delegates and others associated with the organization of the congress and the exhibition, who were received and greeted on behalf of the British Government by Robert Mellish, M.P., joint Parliametary Secretary of the Ministry of Housing and Local Government.

Later on in the evening there was a big get-together for all delegates at the Savoy Hotel. This was a splendid party, where everyone seemed to meet and talk with everyone else, for which the joint hosts were the Gas Council and the Electricity Council.

After the opening session on Tuesday morning, a large number of delegates were the guests, at the St. Ermins Hotel, for a luncheon at the invitation of Shell-Mex and B.P. Ltd.

The same evening saw the National Coal Board acting as hosts at a dinner for several hundred delegates in the famous Cafe Royal in Regent Street. In the Chair was the Deputy Chairman of the Board, Sir Humphrey Browne.

On Wednesday evening more than 300 delegates were at the Connaught

*At the Lancaster House Reception. Left to right: H. H. Browne, J. H. Street (both Min. of H. & L. G.), Sir Alan Wilson, President, and Robert Mellish, M.P., Joint Parliamentary Secretary, Min. of H. & L. G.*

*Another view of the audience*

*Four of the Japanese delegates. The lady is Miss K. Tomita, M.D., joint author of one of the papers*

Rooms for the official Congress Dinner, which included a first-class floor show and dancing. This was organized by the Society, but on this occasion tickets had to be purchased.

Finally, on the Thursday evening, as a fitting climax to the week's events, came the reception given by the Lord Mayor and Corporation of the City of London in the historic Guildhall. Glamorous is an overused word these days, but it still seems the right one to epitomize the colour, the medieval splendour, and the dignity of the occasion. We know that a similar reception in 1959 is still vividly remembered by many, and this one too will not be quickly forgotten, especially by our overseas friends.

Two other events should be recorded—a reception for the German delegates at their Embassy, and a cocktail party for lady delegates given by the Women's Advisory Council for Solid Fuel at their headquarters in South Molton Street.

## The Technical Visits

The final day of the Congress was devoted to a varied programme of technical visits, each intended to demonstrate some aspect of air pollution control or illustrate the subject matter of a Paper presented during the Congress.

Sixty delegates, in two parties, under the leadership of Dr. Albert Parker, C.B.E., and R. B. Partington, visited the *Warren Spring Laboratory* of the Ministry of Technology and the *Air Pollution Research Unit* of the Medical Research Council. Delegates were able to see the instrumentation of the national survey and by means of excellent diagrams grasp the year by year significance of the survey. Members of the Laboratory's staff also described their investigations into methods of reduction of pollution of the air.

At St. Bartholomew's Hospital an opportunity was presented to study the four main sections of work undertaken in the separate laboratories of the Unit, *i.e.*, physiology, chemistry, physics and epidemiology. In the last the effects of changes in the incidence of pollution on the health of patients who attend chest clinics and on the incidence of deaths in Greater London are studied.

A small party of 20 delegates, led by A. W. Davies, were welcomed by the Director General of the *Leatherhead Research Laboratory* of the British Coal Utilization Research Association and saw evidence of the various studies being made of the problems of coal combustion and gasification, the development of small domestic appliances to burn bituminous coal smokelessly and the extensive basic research

*Some more of the delegates—concentrating*

*A Lancaster House group. Left to right: Dr. Jose and Mrs. Rispoli (Argentina), Dr. K. Boisseree (W. Germany), Dr. Ana Singermann (Argentina), and Dr. C. E. and Mrs. Barthel (U.S.A.)*

*Session III—A. C. Saword, Rapporteur, and Professor A. Roussel, Chairman*

*Delegates on the Friday visit to the Esso Oil Refinery at Fawley*

*Inspecting the gas cleaning plant at the Halesowen foundry. Left to right are: J. H. Grainger, Dr. Boisserée, visitor not named, B. O. Goodwin (Manager, Harold Andrews (Sheepbridge) Ltd.) A. Archer (leader of party) Dr. Wieweg, and F. M. Shaw*

kinetics of formation of sulphur trioxide and other noxious gases.

At the *B.P. Research Centre*, Sunbury-on-Thames, a small group of 12 led by E. A. Taylor, were able to see the extensive research undertaken at the laboratory to obtain basic information on the dependence of pollutant concentrations (unburnt hydrocarbons, carbon monoxide and oxides of nitrogen) in exhaust gases on engine conditions.

Two of the best attended visits were to Central Electricity Generating Board installations. One, a visit to *Bradwell Nuclear Power Station*, attracted a representative group of 20 who were able to see the first Nuclear Power Station to be completed in the CEGB's nuclear power programme. Bradwell comprises two graphite moderated carbon dioxide cooled reactors fuelled with magnox-sheathed natural uranium and six 52 MW. main turbo generators.

The second visit, to the *Research Laboratory at Leatherhead* comprised a symposium at which the results of recent large-scale scientific investigations on air pollution at Tilbury Power Station were presented. During the symposium new dust measuring instruments were demonstrated and a laser used for plume height measurement and inversion detection was shown in operation. Forty delegates attended the symposium, an account of which is given on another page.

Another party representative of four nations attending the Congress visited the *Esso Oil Refinery* under the leadership of H. Clusky. Travelling by train, the 23 delegates were able to study Britain's principal oil refinery on the edge of the New Forest and soon to become one of the largest in Europe when the present building extensions are completed. Since its inception the refinery has been very sensitive about air and water pollution prevention and over £1 m. has been spent on the design and the operation of plant solely concerned with minimizing pollution.

Another popular visit was undertaken by a party of 22, under the leadership of G. W. Dhenin, to the *Methane Terminal* and hydrocarbon gasification plant at Canvey Island, Essex. The Terminal which was constructed by the North Thames Gas Board for the Gas Council now receives 12,000 ton cargoes of liquid methane from Arzew, Algeria, in two methane carrying ships. Up to 22,000 tons of methane is dispatched into the national grid at more than 100 m.c.ft. per day.

A visit that has subsequently attracted considerable press publicity was devoted to a study of local industrial pollution problems in the Midlands. S. Cayton led the party of 16 delegates who were welcomed by the Mayor of Halesowen, Cllr. R. Bird, and shown two foundries where newly installed equipment is drastically reducing the menace of grit, dust and smoke.

The National Coal Board visit to the Multiheat Plant in South Wales had to be cancelled at the eleventh hour and instead of a train journey to Cardiff the small party of seven delegates travelled to the lovely Evesham Vale to visit the *Stoke Orchard Research Establishment*, under the leadership of H. W. Davies.

The most distant visit for delegates was to the *Spencer Steel Works* of Richard Thomas & Baldwins Ltd. at Newport, Mon. G. B. Courtier took an international group of eight by train and in the course of a most extensive tour of the 2,800 acre site the delegates confronted the variety of problems involved when an annual output of 1.4 million ingot tons of steel has to be produced without causing amenity affront to the surrounding neighbourhood.

The *Central Laboratory of the Shell Organization*, Egham is undertaking vital research into continuous combustion problems, particularly in relation to stack emissions. The 14 delegates who visited Egham, led by R. F. Relf, were naturally concerned with the aspects of this research related to clean air, and found the experimental work on a new fumeless steel lancing process of great interest.

In the majority of cases delegates were the recipients of very generous hospitality from the host organizations and besides presenting valuable opportunities for field study the visits could be said to have contributed to the spirit of international co-operation and amity that persisted throughout the Congress.

## The Exhibition

The Clean Air Exhibition held in conjunction with the Congress was staged in the New Horticultural Hall. It was supported by 44 exhibitors, of whom eight upheld the designation "international", by either a direct overseas link of through an associated U.K. trading company. Bodies engaged in the direct promotion of clean air or study of air pollution and its effects included the Instituut Voor Gezondheidstechniek TNO, of the Nether-

*The "Coalite" stand*

*The German Federal Republic Government Information stand*

lands, the VDI Reinhaltung der Luft commission for the German Federal Republic, the Warren Spring Laboratory, the International Union of Air Pollution Prevention Association, and the NSCA itself.

Particularly noticed, and given commendation this year, was the high quality of work put into each stand, the interesting exhibits, and the services given, all of which no doubt created the satisfaction expressed by many visitors. The Federal Republic of Germany Clean Air Information Stand, organized by the VDI commission, displayed in brilliant fashion the work being done in that country, using facts, photographs and working models, with the help of an attractive and specially printed Information Booklet. (Some copies of this are still available and may be obtained free of charge on request from the Society.) The small information panel erected to illustrate a contribution to the discussion by TNO attracted much attention by its technical information. A large number of information request cards were filled in and left at this exhibit, and the Institute has now prepared and sent to all inquirers a special booklet reproducing the diagrams and explanatory text. (The

*The Radiation stand*

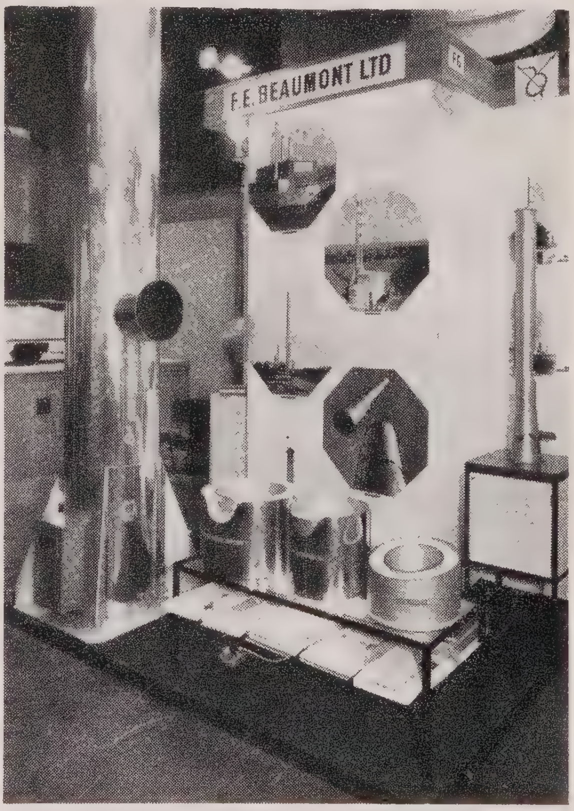
"*Rexco*" *staged an attractive open stand*

*The mobile pollution monitoring laboratory from Germany attracted much public attention*

material relates to the health aspects of air pollution, and any further requests for the booklet sent to the Society will be forwarded to TNO for attention.)

Attendance at the Exhibition was good and the overall aesthetic and decorative design of the hall was favourably commented upon by many. The visual appeal was added to by the launching into the high ceiling space of a large meteorological balloon, anchored to the floor by a long guide line. At the first it gave some consternation to the exhibitors and fire authorities, but this was soon overcome and the balloon remained aloft through the period of the exhibition.

The exhibition was organized by the Society itself, and preparation are already in train for the clean air exhibition to be staged at the Winter Gardens, Blackpool from 17 to 20 October, 1967, in conjunction with the Society's annual conference in the same building.



*F. E. Beaumont Ltd. displayed their well-known chimneys*

## Electric Cars

There has been a remarkable spate of interesting news items about battery driven cars. The Ford Company is reported to be on the brink of a breakthrough that would enable it to build a battery driven saloon with performance for town use equal to a conventional car. This depends on the development of a light-weight fuel cell type of battery. General Motors, in the U.S.A., have demonstrated two experimental vehicles, a fuel cell van and a battery driven passenger car. They also mention other advanced work on a lithium-chlorine fuel cell. Batteries using silver and zinc, and sodium and chlorine, are other types on which work is being done. Renault in France, in partnership with three other firms, are reported to be developing a fuel cell battery generating electricity out of crude oil by a chemical process. As reported on another page, efforts to electrify the bus system at Osaka in Japan are being made.

# INTERNATIONAL SECTION

*Netherlands*

## ROTTERDAM INVESTIGATION

**Verontreinigde Lucht. Dr. K. Biersteker, pp. 140, plus detachable tables, pp. 74. Van Gorcum & Comp., Assen, Netherlands.**

This is the report or thesis by Dr. Biersteker described by Professor J. S. Tesch in our last issue (Autumn, 1966, p. 17), and we are pleased to mention it again as the first air pollution book we have received from the Netherlands. Professor Tesch's description of this work, for which Dr. Biersteker received the degree of Doctor of Medical Science, makes a further account unnecessary, but any non-Dutchspeaking reader will find that the book contains, at the end, an excellent summary of each chapter in English. There is also a very full bibliography of between three and four hundred references.

*Sweden*

## GOTHENBURG STUDY

We have received from the Principal Medical Officer of Health, Gothenburg, (Public Health Department, Odinsgatan 4), an English language copy of the report on an air pollution study made during 1959 to 1964.

Gothenburg, with a population of 400,000, is the second largest city in Sweden, is the biggest port in Scandinavia, and has a unique concentration of shipyards, mechanical industries, oil refineries and other large plants.

The air pollution study, which was directed by the Gothenburg Air Pollution Committee (LUG) was financed by contributions from three Government research councils, one private scientific fund, one commercial association, and the City Council.

During the years 1959–62 a general air pollution survey was carried out, using the British standard deposit gauge and the lead peroxide candle method at 30 stations, and daily smoke and sulphur dioxide measurements using the volumetric apparatus at five stations. Full details of the survey and the result obtained are given.

A medical pilot study was undertaken to determine whether there is any connection between varying pollution conditions and health, using the methods developed by Dr. P. J. Lawther in his investigation of patients with chronic bronchitis in London. The results of this study, admitted to be limited, appear to be inconclusive.

Finally, in 1962–64 a new programme was established and daily mean values for sulphur dioxide and smoke were measured for one station only, together with a continuous recording of carbon monoxide as an index of pollution from vehicle exhausts.

The surveys showed that the deposits of particulate matter were highest in the industrial area, where they are about the same as the highest in London. Sulphur dioxide levels were found to be lower than London and cities in the United States, and even Oslo. Carbon monoxide recordings gave a maximum value of 126 ppm. at one site and 109 at another, but maximum one hour mean values reached only 26 and 20 ppm. at these sites.

Air quality standards (*i.e.*, maximum allowable ambient air concentrations) are proposed, and comparisons made with such standards in the USSR, the USA and Germany. As is usual with these MAC standards, little is indicated on how they are enforced, or will be enforced, specifically.

*U.S.A.*

## "STAUB" IN ENGLISH

The Department of Health, Education, and Welfare have announced that the Public Health Service is sponsoring the translation and publication in English of the West German technical journal, *Staub-Reinhaltung Der Luft* (Dust-Clean Air Maintenance).

Translation and publication of the journal are a joint project of the Division of Air Pollution and Division of Occupational Health of the Public Health Service. Translation is being done by the Israel Programme for Scientific Translations and paid for with United States-owned excess foreign currency available in Israel.

The monthly journal contains technical articles on the effects and control of dusts, gases, vapours, and radioactive particles. Special emphasis is placed on dealing with sources of community air pollution.

A limited number of copies of the English translation, beginning with the January 1965 issue, will be made available to technical libraries and to governmental agencies, scientists, and non-profit institutions concerned with air pollution. The remaining copies will be for sale by the Clearinghouse for Scientific and Technical Information at a subscription cost of $24 a year; individual issues will also be available, with prices depending on size of the issue.

Inquiries should be addressed to the Clearinghouse for Federal Scientific and Technical Information, U.S. Department of Commerce, Springfield, Virginia 22151, or the Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C. 20201.

## STERN'S "AIR POLLUTION"

An advance announcement has been made about the publication, in three volumes, of a new edition of *Air Pollution*, the comprehensive manual edited by Arthur C. Stern, Assistant Chief, Division of Air Pollution, U.S. Department of Health, Education and Welfare. 56 authors are listed in the tentative contents notice. Publication is due late in 1967. The price is not yet announced, but further particulars can be obtained from the publishers, Academic Press, 11 Fifth Avenue, New York, N.Y. 10003, or Berkeley Square House, London W.1.

*Fed. Rep. Germany*

## VOLKSWAGEN AND EXHAUST GASES

At a conference held at Baden-Baden, Prof. Heinrich Nordhoff, chairman of the directorate of the Volkswagenwerk, showed much restraint in his utterances concerning the problems of exhaust-gas decontamination. He expressed the conviction that the end aimed at would not be achieved as long as cigarette smokers inhaled much more carbon monoxide than was given off by cars. None the less work on exhaust-gas decontamination would be continued, and it was hoped that Volkswagen could equip their cars destined for the American market with appropriate devices by 1968, within the period prescribed. In this connection, however, the question of the ready availability of the requisite devices should be taken into account. For this reason, priority claims had to be complied with. Therefore, Volkswagen cars for the European or German market were unlikely to be furnished with exhaust-gas decontaminators as early as from 1968 onwards. By the fitting of such a device, Nordhoff emphasised, prices of cars would go up "by much more" than merely 3 per cent anyway. *Handelsblatt*, 26 September, 1966.

*Poland*

## CONFERENCE ON PRECIPITATORS

Organized by the Polish Association of Engineers and Technicians of the Metallurgy Industry, a two day conference was held on 17 and 18 November at Katowice.

The subject was the application of electrostatic precipitators in heavy industry, particularly in metallurgy. 15 papers were read by overseas and Polish authors, We hope to receive a report of the conference, further particulars of which can be obtained from the Association at Katowice, ul. Podgorna 4, Poland.

*Japan*

## ELECTRIC BUSES

It is reported that Japan's second largest city, Osaka, is planning to tackle the problem of air pollution by converting its 1,900 buses to electric propulsion, using batteries.

The plan hinges on whether a recently developed storage-battery system can be further improved.

The present battery, weighing 12 cwt., gives a 70 passenger bus a range of 83 miles on level roads on a single over-night charge.

The city authorities have commissioned the battery designers to increase the storage capacity to yield an additional 20 miles without increasing the weight of the battery.

### Report from Tokyo

Another press report from Japan says that the capital is mobilizing for "total war against poisonous smog that grows thicker and deadlier every month". It continues: "The smoke and automobile exhaust are bringing heavy destruction to the 4,400 pine trees bordering the Imperial palace. Soot and dust, coating the pine needles are killing the trees, many of them hundreds of years old. Animals, which have died in recent years at Japan's biggest Ueno zoo, 70 per cent have reportedly been victims of air pollution.

Chimpanzees, the only animals able to adjust themselves environmentally like human beings, grow nose hair for self-preservation.

And a Tokyo University scholar warns that unless something drastic is done to protect Tokyo's famed cherry trees, Japanese will have to go to Washington, for glimpses of their national flower in full bloom. Thousands of cherry trees are in danger of becoming extinct in Japan because of smog."

*Europe*

## GERMAN COMPANIES JOIN OIL INDUSTRY'S POLLUTION ABATEMENT PROGRAMME

Three German oil companies, whose refineries have a combined rated capacity of some 300,000 barrels a day, have joined the petroleum industry's co-operative effort in Europe to combat air, water and soil pollution attributed to oil operations.

The three companies, Gelsenberg Benzin A.G., Scholven Chemie und Union Rheinische Braunkohlen Kraftstoff A.G., are now participants in Stichting CONCAWE, a foundation established in The Hague at the end of 1963 by the Oil Companies' International Study Group for the CONservation of Clean Air and Water, Western Europe.

With the German memberships about 70 per cent. of the refining capacity of Western Europe is now represented by CONCAWE, whose principal role is to establish the technical background to pollution and to offer information on pollution abatement to the participating oil companies and authorities interested in solving pollution problems.

Other companies participating in CONCAWE are: B.P., Shell, Esso, Gulf, Caltex, Mobil, Compagnie Française de Raffinage and Union Générale des Pétroles.

# *Air Pollution at Hague Conference*

The Royal Society of Health spread its wings by holding an international health conference at the Hague in September last. About 40 countries were represented by some 400 delegates, the greater number of whom were from the United Kingdom. One of the sessions was devoted to air pollution.

Dr. Albert Parker, C.B.E., was in the chair for this occasion. In his introductory remarks he said that the West European cities, with a population of about 345 m., were using annually about 45 m. tons of solid fuel and 280 m. tons of oil fuel.

"From the uses of these fuels alone," he went on, "I estimate that there are discharged annually into the air at least 3 m. tons of smoke, mostly from burning coal, and more than 20 m. tons of oxides of sulphur. Motor vehicles in Western Europe now consume each year about 45 m. tons of petrol and discharge exhaust gases containing at least 20 m. tons of carbon monoxide."

**Professor ir. H. Eilers**

The first of the three papers presented—which were read in full—was by Professor Eilers of the Netherlands Ministry of Public Health. He said that air pollution did not obtain much attention in the Netherlands until after the second world war. This was due to the rapid industrialization, especially in the chemical and metallurgical sectors, and the increased intensity of motorized transport. The classic source of air pollution in Great Britain, domestic heating appliances, was of relative small importance in the Netherlands, as the solid fuel there was of relative good quality and was used in closed stoves of good construction.

Since the war there had been a large shift from coal to light distillate oils with low sulphur content for private heating installations, and to heavy residual oils for large furnaces. When natural gas came into use on a large scale for heating purposes a further reduction of the pollution might be expected.

The concentrations of standard smoke and of benzpyrene in the atmosphere in the Dutch cities were much lower than in British ones, but that of sulphur dioxide was similar.

A first indication of the regions of the Netherlands where air pollution might be observed was obtained from the observations of Barkman on the disappearance of epiphytic lichens, organisms very sensitive to air pollution, especially to sulphur dioxide. The large industrial centres in the Netherlands and in adjacent parts of Belgium and Germany may be seen as the cause of this phenomenon. Air pollution in the Dutch centres (Rotterdam, Amsterdam and Ijmuiden, the mining district in the south and the areas along the shipping canal to Ghent, Belgium) was described.

A survey was given of Dutch research institutes dealing with air pollution problems, *e.g.*, damage to vegetation and meteorological factors. Some Dutch investigations on health aspects of air pollution were discussed. In these investigations no clear correlations could be found between mortality or morbidity and air pollution in the centres investigated (Rotterdam and Geleen); in a comparative study on respiratory diseases in cotton workers in the Netherlands and in Great Britain, the relative purity of the air outdoors in the Dutch district was thought to be a favourable factor.

The main legal instrument in the

struggle against air pollution in the Netherlands was the Nuisance Act. It enabled steps to be taken to reduce air pollution by industry; the principle of this law was outlined. As no European country could collect, through its own research facilities, all the information necessary for the control of air pollution, there was a need for international co-operation in this field. The work of some international bodies and national institutes in foreign countries was summarized.

### Professor E. Leclerc

The next paper, on air pollution in Belgium, was by Professor Edmund Leclerc, Director General, Belgian Centre for Water Research and Documentation and Professor of Analytical Chemistry, Liège University.

He discussed the problem under the headings of domestic heating, transport, town planning, industries, and preventive action.

The importance of domestic heating in relation to urban pollution was recognized, and although centralized heating concerned only a small proportion of the population, it was being studied in the different regions. The use of electric heating had not undergone a spectacular development on account of the cost of electricity, but this situation would be changed during the next 15 years through the development of nuclear energy. Eventually the utilization of natural gas from Holland would make a positive contribution to the quality of the air in the larger towns.

In the sphere of transport and traffic, the examination of different sectors showed that the reduction in pollution due to the electrification of the railways was counterbalanced by the replacement of tramways and trolleybuses by the omnibus which was more profitable. There was a greater air pollution in Europe due to the increased number of cars, light commercial vehicles and lorries, the number of which, in Belgium, continued to rise annually by about 10 per cent.

Today, in Belgium, there was one car to every eight inhabitants (in France and the Grand Duchy of Luxemburg there was one car for each six people).

The importance of traffic is considerable, since it provoked a situation relative to the concentration of carbon monoxide, which might, in local areas, rise temporarily up 15–45 ppm. This mainly concerned the average content in the important towns which could be affected by concentrations of such an order.

On the other hand, the layout of routes for the fast traffic; the design of crossroads; and the provision of electricity, gas and water supplies and sewage disposal, all made a serious contribution to the reduction of air pollution in the larger towns.

In industry in general, for the necessary improvement in air pollution control, calculations must be made based on the number of details available in every sector, but those that had been collected to date are largely insufficient to enable statistics to be compiled to give adequate answers to the problem. Modification techniques and direct technologies now presented certain dominating features characteristic of large industries which tended to react towards better control of pollution.

Finally, they were concerned with the advancement of the legislation on atmospheric pollution, the byelaw of 28 December, 1964, setting the actual time after which the responsible authorities passed from the stage of study to that of operation.

### J. P. Détrie

The third paper, on "Control and Development of Air Pollution in France", was by J. P. Détrie, Director of the Centre Interprofessionel Technique d'Etudes de la Pollution Atmospherique (CITEPA), Paris.

We first quote the official summary of the paper:

"As in many countries, the fight against industrial effluents has only recently been extended to emissions from domestic fires and motor vehicles, the general law of 1961, the decrees and orders of 1963–1964 are discussed.

"The paper describes how the enacted measures have been chosen and have come into force and what other solutions are considered. The results which have been obtained are presented in the form of diagrams for the department of Seine. In spite of a noticeable improvement, it is not yet possible to make any final conclusions because of the variation in weather conditions, the importance of which is emphasized, and the lack of data relating to the effects of this pollution.

"However a very general lesson is drawn from this experiment carried out in Paris by indicating the effective means for the control of air pollution in big towns."

Two quotations from the paper itself must be given in full:

"Paris, city of 3 m. people, has the highest population density in the world (32,000/km$^2$) after Hong Kong, with the parking of 1,200,000 vehicles, and, at the same time, less green open spaces, which now run at one square metre per person. Because of their use for the improvement of race-horse breeding, the fields situated on the borders are more remunerative than those reserved for the human race—and also for their cemeteries. To quote Jean Girandoux: *Honour to this city, which gives more oxygen to its dead than to its living.*"

And, concluding, M. Détrie said:

"Please excuse me, Mr. President, Ladies and Gentlemen, if I have taken too long in describing the problems of of Paris, but one speaks most easily of what one knows and loves most, and the growth of this town, harmonious, cleaned-up and renovated, again gleaming white under the clear sky, is a subject particularly near to my heart. But I fear we may see this harmonious concept disturbed by great concrete walls which rise higher and higher, rectangular, and inhumane, replacing the old buildings and the gardens.

"But, in describing the experience of Paris, I trust I have shown you that the 'Fight against atmospheric pollution' is not solely concerned with fuels, combustion or with carburation, it is also a problem of central and local government, and a problem of the behaviour of Man.

"Yet, the technical solutions already in application, and those that one hopes for, like the development of gas, of electricity by atomic power, of motors and engines driven by combustion or turbines, are hard to keep adjusted to our towns—such developments being relative to the concentration of inhabitants and contributing to their increased comfort in living.

"Pending the 'right fuel' and the 'right engine' one must appeal for the 'right man' and his public spirit—perhaps an outmoded concept in a world in which egoism, pride and self-interest prevail. Everyone of us who knows his job, chiefs of government, works directors, planners, architects, doctors and hygienists, heating engineers and engineers, or users of the simple stove must '*think pollution*', and use the preventive schemes, the installations, the proper chimneys, and the correct exhaust systems, rather than criticize those things in his neighbourhood. Success depends on the efforts of all, and not upon 'miracle' solutions."

The discussion that followed the three papers was opened by Professor J. W. Tesch, President of the Netherlands Institute for Health Research, followed by Arnold Marsh, Director of the National Society for Clean Air, United Kingdom. Other U.K. speakers were Dr. S. R. Craxford, head of the Air Pollution Division, Warren Spring Laboratory, and Dr. W. C. Turner, Associate Medical Officer, Tower Hamlets, and Deputy Chairman of the NSCA.

### Air Pollution Bill

In the House of Commons on 22 November, 1966, a Bill to make further provisions against air pollution, on the motion of Robert Edwards, M.P., was given its First reading. This was agreed to, and the Second reading was put down for Friday, 28 April, 1967. A fuller report will be given in our next issue.

INTERNATIONAL UNION OF AIR POLLUTION PREVENTION ASSOCIATIONS

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## London Conference 1966

## *PROCEEDINGS - PART II*

Part I of the Congress Proceedings, published prior to the meeting, contained all the 91 Papers presented. A very few copies are still available, price £2 4s. each, including postage.

Part II will contain the opening address (Session I), the Rapporteurs' Reports, discussion, and Authors' replies, on each of the other seven sessions, with the remarks of the Chairmen and Deputy Chairmen. For many readers, interested in clean air generally, rather than in specialized aspects, this volume may be found more useful than Part I as an annotation and critical survey of the proceedings as a whole.

Part II is now in course of preparation and will be published as early as possible in 1967. The price will be £2, but if ordered before 31 January, 1967, a special price of 30s (or equivalent in other currencies) will be made.

Orders should be sent to the National Society for Clean Air, Field House, Breams Buildings, London, E.C.4., England

# CLEAN AIR EXHIBITION

*Winter Gardens*
*(Leopold Grove Exhibition Floor)*

## BLACKPOOL

## 17-20 October 1967

In conjunction with the Annual Conference of the National Society for Clean Air

* * *

*Inquiries and space reservations from the Exhibition Organizer, National Society for Clean Air, Field House, Breams Buildings, London E.C.4*

*Review*

# NEW TEXT BOOK ON FUEL

**An Introduction to the Study of Fuel, by J. C. Macrae. Pp. 352. Elsevier Publishing Co., Barking. 60s. net.**

Although this book is called an introduction, it is in fact a thorough and comprehensive work. Its author J. Macrae, B.Sc., F.R.I.C., F.Inst.F., is Senior Lecturer in the Houldsworth School of Applied Science, Leeds University.

The book is intended for engineering and applied science students, and for those intending to enter the field of fuel technology, but it will be of value to those who need to have a sound knowledge of the principles and practices of fuel technology and combustion—including smoke inspectors. The last chapter is an outline of air pollution by combustion products.

The book is divided into three main parts. The first provides a general account of the whole field of fuel and power. This is followed by a systematic survey of the occurrence of coals, their nature and properties, and their conversion into the desired secondary fuels. The second part describes the origin, prospecting for, and production and processing of liquid petroleum and natural gas. Secondary products, including fuel and petrochemicals, made from hydrocarbon raw materials, are reviewed. This survey of materials leads to the third main part of the book, which deals with aspects of the broad topic of energy conversion. A general picture of nuclear plant available for the large-scale generation of power in civil reactors is given. The writing is clear and ordered, with a useful emphasis from time to time by a judicious use of italics. The book is excellently printed and produced, and the publishers are a Dutch firm with companies in Britain and the U.S.A.

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## Facts about Clean Air

**Environmental Health, 1965. Pp. 51, Association of Public Health Inspectors. 5s. net, post free.**

This report, brightly printed in black and orange, contains useful information on a number of subjects that are the concern of the members of the Association, based on information received from all parts of England and Wales, except inner London. Returns were made from 674 local authorities with a population of 26 m.

The section on clean air contains some facts, not otherwise readily available, about action under the Clean Air Act. Thus in 1964, while 1,267 contraventions of the dark smoke provisions of the Act were recorded in the districts covered by the report, legal proceedings—all successful—were instituted in only 31 instances.

3,153 notifications of intent to install a furnace were received in accordance with section 3 (3) of the Act, and 913 applications for the prior approval of furnaces (s. 3 (2)) were granted in 1965.

161 contraventions of s. 5 of the Act, relating to the minimization of grit and dust emission, were detected.

Section 10, concerning control of the height of chimneys, led to the receipt of 2,164 plans showing new chimneys, of which 1,930 were approved. 22 chimneys which were erected were found not to comply with plans approved by the local authority, and 364 chimneys outside local authority control were erected.

A section of the report is on Port Health Inspection, and this contains further information on action under the Clean Air Act. It is said that economics and international shipping competition have resulted in the scrapping of many of the old hand-fired coal-burning vessels which originally caused much of the air pollution in ports. They have been replaced by vessels with diesel engines or oil-fired steam powered vessels with much better combustion and operational efficiency.

A new problem has arisen in one large port where new high blocks of flats have been erected close to dock perimeters. "Vessels close to the flats", it is stated, "must exercise strict smoke control as an emission of smoke in such cases, although well within a prescribed legal limit, can create nuisance to the occupiers. Funnel gases without smoke are also a nuisance under certain circumstances. It requires much tact to convince the aggrieved tenants that the vessel has not contravened the Act and that everything is being done to obviate the nuisance".

## Fuels Diary

**Fuel Efficiency Diary, for 1967. Edited by H. B. Locke. H. O. Quinn Ltd., 151 Fleet Street, London, E.C.4. 13s.**

We commended this diary when it was first published 10 years ago, and we are glad to report that it is still going strong. It is a most useful diary for anyone concerned with or interested in fuels, and the 1967 edition has been reset and completely revised. In addition to the usual diary features, including road and London Underground maps, the reference section is remarkably comprehensive for so small a volume. This part covers physical data, conversions, flow, fuels, combustion, boilers and furnaces, instruments, heat transfer, steam usage, electrical, prime movers, and general information.

*Clean air is coming fast to what used to be one of Lancashire's smokiest towns—Bolton.* (*Photo: Tillotson's Newspapers Ltd.*)

# *Reports from the Fuel Industries*

## (1) Coal

**Report and Accounts, National Coal Board, for 1965-66. Vol. I, Report (6s. 6d.) Vol. II, Accounts and Statistical Tables (19s. 0d.), H.M.S.O.**

The report (for the year ended 26 March, 1966) records both progress and achievements on the one hand and frustrations on the other. Productivity in the coal industry increased by almost four per cent during the year—well above the national average—but output and productivity were held down by a serious shortage of manpower. There was a fall in sales, mainly because the railways and gas industry used less coal, and exports declined. For power stations, now the industry's largest customers, demand levelled off because of the expansion of electricity generation from nuclear power. An encouraging rise in the sales of solid smokeless fuels is recorded.

The Report says: "The Government's 'National Plan' and the White Paper 'Fuel Policy' which were published during the year, contained estimates that by 1970 the market for coal was unlikely to exceed 170-180 m. tons a year. The publicity given to these estimates and to the classification of the Board's collieries according to their future prospects led to a loss of confidence within the industry. This was one of the causes of the drift of men from the collieries at a rate much faster than the industry could afford or make good by increased productivity".

Nevertheless, despite the fall in output, productivity continued to increase, with a coal face production average of 109·7 cwt. a manshift, which is an increase of 5·9 per cent on the previous year.

The industry's potential for increased productivity was dramatically illustrated during the year at the Rawdon colliery in the East Midlands Division. Here, in one week in April, a new world record in coal face production was established by eight men who operated a 200 h.p. ranging drum shearer over two shifts a day and produced 4,860 tons of coal—an output per manshift of more than 151 tons.

Effective use of labour is being secured by increasing mechanization, and 80 per cent of the total output is now from power-loaded faces.

Disposal of coal was 185 m. tons, which were 7·1 tons less than the previous year. Power stations took 68 m. tons, and domestic users 23·6 m. tons (excluding miners' coal)—a fall of 2·4 per cent. Railway usage fell from 2·4 to 1·4 m. tons.

### Solid Fuel in the Home

Sales of the Board's naturally smokeless and manufactured fuels increased by 140,000 tons to 2·6 m. tons. Since 1959 the Board's smokeless fuels market has increased by almost 500,000 tons, and now forms more than 10 per cent, of domestic sales.

The report goes on:

> "The increasing trend towards smokeless fuels is due to the extension of smoke control areas and to the growing popularity of central heating. The modern open fire equipped with a high-output back boiler provides the cheapest source of domestic hot water and partial central heating. Many people in smoke control areas wish to retain an open fire and new smokeless fuels, such as 'Homefire" are being developed to meet their requirements. Roomheaters also have much of the

*Flats in Paisley, Scotland. Part of a large new residential estate with all heating and hot water by central coal-fired boiler plant*

> attraction of the open fire and many can supply full or partial central heating. They are becoming increasingly popular and several new models were introduced during the year. 'Multi heat' the new smokeless fuel which came on the market in 1965-66, is ideally suited for use in room-heaters as well as in central heating boilers."

It is recorded that a total of almost 214,000 new central heating systems using solid fuel were installed during the year, more than any other type of system.

There is much more information of interest in the report to those who are concerned about the more efficient use of the nation's largest natural energy resource. Reference is made, for example, to recent developments in the field of district heating. It is said that the Billingham scheme (the subject of a paper at the NSCA conference at Eastbourne in 1965) has confirmed in practice the benefits of using a central boiler plant. By the end of March, 1966, 25 coal-fired schemes were in operation, under construction, or in the final stages of design. During the year, eight new schemes came into use, including those at Leicester, Sunderland and Bridgend.

## (2) Gas

**Annual Report and Accounts, 1965-66. The Gas Council. H.M.S.O. 16s. 6d.**

The frequent news reports of natural gas finds under the North Sea and in Yorkshire make it hardly necessary to say that the new annual report of the Gas Council is cheerful and confident. An illustrated booklet, highlighting the main features of the report, is aptly called "Year of Discovery".

Apart from the new prospects opened up by the discovery of abundant quantities of natural gas under the North Sea, and in Yorkshire, present day progress continues to be as much as any industry can desire and cope with—a nine per cent increase for the year, following one of eight per cent, for the previous year. All the Area Boards, with the exception of the Scottish, showed a surplus on the year's working: a total of just over £11 m. for the industry as a whole.

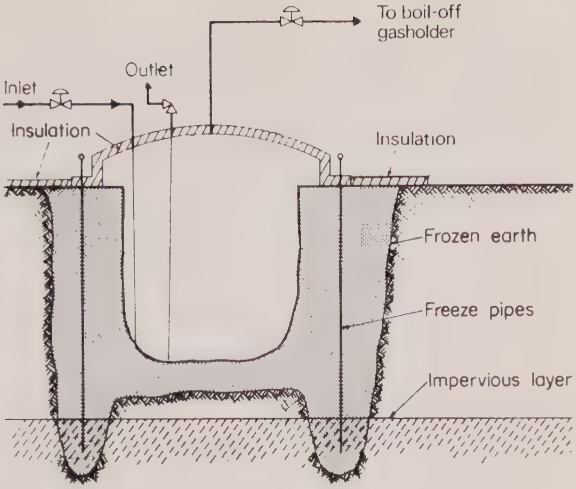
57 per cent of gas sales go to the domestic market. Industry takes 26 per cent., and commercial users 14 per cent. Although the number of domestic consumers went up by only one per cent (to 12,251,000) the average consumption of gas per household rose by 15 per cent. This shows how homes that use gas are using it more and more, as is seen by the fact that central heating installations rose by 34 per cent to 185,000, and the sale of roomheaters were up by 8 per cent to 991,480.

Less coal was used to produce gas during the year, and the quantity of oil went up. Even so, 17·5 m. tons of coal were used compared with 2·5 m. tons of oil. Coke production continued to fall, and was down to 7·6 m. tons.

## The Future

Naturally much emphasis is aid on the prospects from North Sea and other natural gas, although the prospects are brighter now than they were when the report was written. Facts are given about plans already being made—especially the first shore terminal and pipeline for the gas from the BP field. From this terminal the gas will be taken 90 miles to the existing methane pipeline. It is expected that gas will begin flowing in the summer of 1967. The Council is planning a national high-pressure grid incorporating the existing methane system that takes the north African gas from the Canvey terminal.

Parallel technical studies are being carried out first, on the implications of the conversion of town gas plant to use natural gas as a feedstock, and second, on the short-term replacement of liquid feedstock by natural gas.



*Typical arrangement of a Frozen Ground gas storage unit. Frozen ground storage utilizes the "cold" of the liquefied gas to maintain the ice barrier that forms the container. The capital cost is much less than that of an insulated tank.*

Consideration is being given to the establishment of stores for liquefied methane at strategic points on a future natural gas network, in addition to frozen ground storage at Canvey Island. This latter development, which we illustrate, is most interesting, and may help to solve the problem of building up reserves of gas ready to cope with the heavy load that develops during very cold weather. Underground storage is the other line that holds promise, and geological exploration for potential zones was carried out at two sites. At one of these, near Chipping Norton, Oxfordshire, eight further wells are planned for 1966–67.

The capacity of Catalytic Rich Gas plants on order is now 703 m. cubic feet per day. This Gas Council process makes a methane-rich gas from light petroleum distillate and can be adapted to produce a substitute for natural gas. Plants with a capacity of 1,023 m. cubic feet of town gas a day are on order employing the Gas Recycle Hydrogenation process, which can also produce a natural gas substitute. Plants with a capacity of 145 m. cubic feet a day came into service during the year.

Since the period covered by the report, a six-man team has visited the

United States and Canada to study the methods of dealing with technical problems of distribution, the economics and finance of pipeline systems; the organization and finance of conversion; the growth in demand experienced with the introduction of natural gas; and peak saving and storage systems. European countries have been visited by other teams.

Among research projects listed in the report it is interesting to note that coal is not being neglected. Preliminary experiments have been carried out on the hydrogenation at ultra-high pressures of powdered coal. The reaction vessel designed last year is now in operation, and preliminary experiments with powdered coal have shown that 60 per cent of the coal can be hydrogenated at 310 atmospheres, and 40 per cent at 100 atmospheres, giving methane yields of 20 and 26 per cent respectively. Further experiments extended over longer periods are now planned, so that certain difficulties inherent in short tests may be overcome.

# (3) Electricity

**Annual reports of the Electricity Council and the Central Electricity Generating Board for the year ending 31 March, 1966. H.M.S.O., 16s. 6d. and 10s. 6d. respectively.**

The total revenue, including income from contracting and sales of appliances, amounted to £1,093·7 m. Total expenditure on revenue account amounted to £1,009 m. leaving a balance of £84·7 m. which will be used to finance capital requirements.

The gross return on average net assets amounted to 12·6 per cent compared with 12·1 per cent in 1964–65.

Sales of electricity to 17·3 m. consumers amounted to 118,286 m. units, an increase of 6·4 per cent. Of this

*The Oldbury-on-Severn Nuclear Power station under construction. The first power station to use concrete pressure vessels. Output: 600 MW*

60,623 m. units went to industry (4·5 per cent up), 50,829 m. units to domestic consumers (7·6 per cent up), 19,008 m. units to commercial users (8·7 per cent up). Of the above 5,300 m. units were sold on off-peak tariffs (36·0 per cent more than in previous year).

The average price to consumers was 1·737d. per unit against 1·652d. for the previous year.

The capital requirements for the year under review amounted to £520·8 m. of which £277 m. were provided from internal resources (46·6 per cent).

The total generating capacity of the 230 stations of the Generating Board on 31 March, 1966 amounted to 39,915 MW. of which nuclear generating plant amounted to 2,823 MW. When the first programme is complete in 1969 nuclear plant will amount to 5,000 MW.

The Generating Board's transmission lines were increased by 1,070 and the Area Board's mains by 8,092 circuit miles during the year.

The total units supplied from the Generating Board's stations amounted to 148,820 m. at an average thermal efficiency from conventional stations of 27·29 per cent. This was lower than the 27·49 per cent of the previous year due to the necessity of keeping in commission during the cold winter of 1964-5 more older less efficient plant and also to the delay in completion of some new plant.

The highest demand met by the Generating Board was 33,358 MW. on the 19 January, 1966. The highest thermal efficiency at conventional stations was 35·70 per cent at West Thurrock. Eight stations had an efficiency over 33 per cent.

The plant commissioned during the year was less than expected. Plant delayed included a number of large prototype units of 300,350 and 500 MW. The first 500 MW. unit was synchronized at Ferrybridge C.

A more efficient system of coal delivery, developed in conjunction with British Rail and the National Coal Board, has been installed at Ferrybridge C. Coal is brought in 26–32-ton hopper wagons which unload automatically without uncoupling and without stopping. One thousand tons can be unloaded in half an hour.

At the end of the year the employees of the Electricity industry amounted to 226,482 against 216,191 a year ago.

# THE WARREN SPRING REPORT

**Report of the Warren Spring Laboratory, 1965. Ministry of Technology. pp. 58. H.M.S.O., 6s. 6d. net.**

The report covers the activities of the Laboratory in the three main fields that are its concern: chemical engineering, mineral science and technology, and air pollution investigation.

The air pollution section records a considerable amount of diverse work, which includes studies on the diffusion of pollution in cities, the effects of buildings near a chimney, the removal of sulphur dioxide from flue gases, the measurement of pollution, diesel exhausts, the effect of tall buildings, and methods of analysis.

Among many points of interest, mention may be made of the work at Cambridge and Bedford on the diffusion of pollution from a city, as compared with diffusion over open country. A solution of fluorescein (a harmless dye) is emitted as an aerosol from a source on a 30-ft. mast, and measurements are made of concentrations reaching a network of sites downwind. Horizontal spread was first measured, but vertical spread is now being studied by samples taken up to 500-ft. using a balloon. The results of the first series of tests do not indicate any very marked departure of the horizontal spread from what would be expected in open country, but further work is necessary to confirm this.

On the investigations into the Reinluft process for the removal of sulphur dioxide from flue gases by active carbon, it is said that many operating difficulties were encountered. Before the process could be recommended for industrial application it would be necessary to make a full economic assessment of a redesigned plant. No further work is contemplated at this stage and the pilot plant has been dismantled.

### The effect of High Buildings

An increasing number of tall blocks of offices and flats are being built in new towns and in the re-development areas of existing towns. The Laboratory therefore decided to examine possible effects on air pollution, and to find out whether such buildings are in fact accompanied by any risk of high air pollution. The presence of such a block alters the pattern of air-flow in the neighbourhood in such a way that the chimney gases from the chimney of the block itself or from other chimneys in the vicinity, could possibly be brought down to ground level and produce pockets of high pollution. There is also the possibility that the inhabitants of the middle and higher levels of the block itself could be exposed to high pollution from neighbouring chimneys.

With the co-operation of the City of London authorities the Laboratory was able to make arrangements with the owners of one such block in London Wall, to install and have access to instruments at various heights on two faces of the block. Three-hourly sampling for smoke and sulphur dioxide was undertaken during March. No dangerous short-term peaks occurred in this period.

A more extensive review of the air pollution work at Warren Spring is included in the new 1966-67 edition of the Clean Air Year Book.

# FUEL EFFICIENCY

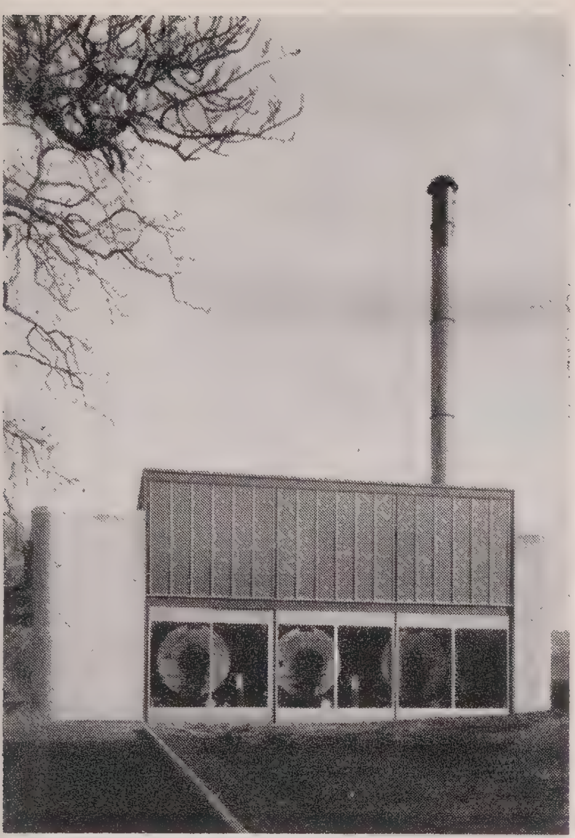
## *Report from N.I.F.E.S.*

The new report, for the year ended 31 March, 1966, of the National Industrial Fuel Efficiency Service shows further good work carried out by the organization. It is the first report to be introduced by the new Chairman, Sir Julian Pode, who pays a well-deserved tribute to his predecessor, Sir Leslie Hollinghurst (who remains a member of the Board).

With its London headquarters and eight area offices, each with its own qualified staff, which includes 164 engineers, NIFES has an income, and expenditure, of over £500,000. The work is sponsored by the nationalized fuel industries, two of the major oil companies, and the Government of Northern Ireland. Thanks to an increase in the income from fees, the contribution from the sponsors were reduced, and it was possible to provide services which do not attract fees.

A section of the report on "The Energy Outlook" points out that since 1953 the annual consumption of fuel has increased by 63 million tons of coal equivalent, at an average rate of 2 per cent per annum. During the same period the Gross Domestic Product has increased at an average rate of increase of 3 per cent per annum. This trend of a slower increase in energy consumption, by comparison with the rise in output, produces useful advantages to the economy—it helps to hold down the demand for imported energy, helps to hold down manufacturing costs, and by lowering manufacturing costs both keeps down the rise in the cost of living and helps British manufacture to meet foreign competition.

NIFES mainly works by providing advisory services and investigations, and also by carrying out consulting engineering work. This latter work has grown considerably during the past few years. Another activity, of direct clean air interest, is the Boiler



*From the NIFES report—A new boiler-house at Elderslie, Renfrewshire. The insulated chimney, the first of its type to be built in Scotland, is of unusual construction, being divided internally to provide three chimneys, one for each boiler*

Operator Courses, for which in the year under review enrolments numbered 501, an increase of 209 over the previous year. In all, 7,870 operators have been trained under the scheme since it started in 1955. The number is likely to go up, as it is known that men with the Hospital Boards are in future to be trained by NIFES.

A section of the report is devoted to case histories or work done during the year. The variety of problems that have had to be tackled makes most interesting reading, and shows how wide is the field of knowledge and experience that can be drawn upon by the organization.

Another section, which would be of interest to many of our readers, is on service to local authorities. About 15 per cent of NIFES work is in fact for local authorities, the hospital boards, government departments and the nationalized fuel industries. Much of the work is aimed at improvements to heating services and to the maintenance of optimum operatives conditions. In more recent years, many local authorities have employed NIFES as consulting engineers during the installation of new heating systems and the construction of new public buildings. In other cases, problems arising from the Clean Air Act have been dealt with, either in connection with the prior approval of new industrial plant, or at plants operated by the local authorities themselves.

The addresses of NIFES headquarters and area offices will be found in the Directory of Organizations in the Clean Air Year Book.

### Lung Cancer

At the International Cancer Congress in Tokyo in October last, Dr. H. Salliotti, pathologist at the Chicago Medical School, is reported to have produced evidence that dust particles in the air, or in cigarette smoke, can be carriers to cancer-causing chemicals into the lungs. Inert dust, loaded with benzpyrene crystals, was injected down the windpipes of hamsters. The dust particles became lodged in the walls of the bronchioles and aveoli; the benzpyrene dissolved and spread through the lungs. It attacked the bronchial tissues, from the inside, avoiding the surface mucosa, and normal cells began changing to cancerous cells. Hamsters injected with dust only did not get tumours.

Dr. Salliotti found that the development of cancers appeared to be checked by Vitamin A treatment.

### Take a Deep Breath

A voluntary body, Citizens for Clean Air Inc., of New York, has enlisted the help of two advertising agencies in a drive to induce the Press to donate space for clean air advertising. One such advertisement shows dense black smoke issuing from what is presumably a central heating chimney, with someone looking out of a window in a nearby block of flats. The main line of text is good: TOMORROW MORNING WHEN YOU GET UP TAKE A DEEP BREATH. IT'LL MAKE YOU FEEL ROTTEN.

# The North West Environment

## *Frank Report*

The North West Economic Planning Council—a Government department—set up an Environment Committee to study and report on environmental questions in the region. The Committee, under the chairmanship of W. L. Mather, studied the problem under 13 main headings: air pollution; water pollution; litter; industrial waste, slag, spoil heaps and tips; eyesores, bad architecture, tree planing, dereliction and area rejuvenation; water; parks and picnic areas; landscaping; the arts; and administration.

It will be noted that air pollution comes first in the list, but before reporting on what the committee has to say on this, one of the introductory paragraphs must be quoted in full. It reads:

"Where there's muck there's money" is an old saying in the North West—a resignation to what was thought inevitable for economic progress. But dirt has brought to the people of this Region many other things in its wake besides "brass"—including sickness, drabness and all sorts of human problems. Broadly speaking, muck is made by men in pursuit of their money but the people who suffer most from it (as with so many of men's failings) are their wives and children. And this is one form of retribution that has been imposed on the third and fourth generations although today this squalor is no longer a price we have to pay for progress and prosperity. Even now in the second half of the twentieth century the ill effects of atmospheric and environmental pollution still bear down most heavily upon the wives who are obliged to spend so much of their time in inadequate and dreary houses, bath the children in enamel basins and spend two or three times the normal amount of time washing clothes and linen which can never become 'White as White'. It is therefore they, more than anyone, who ought to be up and doing and shouting about it—particularly if they represent their fellow citizens in local government."

### Air Pollution

The three paragraphs of the report devoted to air pollution deal entirely with domestic pollution; there is no mention of pollution from industrial sources. From this it may be assumed that the Committee is satisfied that the prevention of such pollution is proceeding satisfactorily under the Clean Air and Alkali Acts, and that they have nothing new to recommend.

After outlining the smoke control order provisions and procedure, the report goes on:

"Smoke control in the designated Black areas in the Region is for the most part running at least two years behind the schedule agreed between individual local authorities and the Minister (in response to circular 4/62); and of the 82 local authorities which had done little or nothing about smoke control orders according to the Minister's circular in January, 1966, some 30 were in the North West. Reasons given were: shortage of smokeless fuels, lack of staff, lack of money, and local opposition. All these difficulties have been overcome by the more go-ahead authorities. Two actions are now suggested: the establishment of smoke control areas should cease to be permissive and become statutory in the Black areas; and the sale of non-smokeless solid fuel in Black areas should be prohibited except for use in appliances licensed as being able to burn bituminous coal smokelessly. The introduction of appropriate amending legislation is a matter for consideration by the Minister of Housing and Local Government: alternatively the latter effect might be achieved by amending the Approved Coal Merchants scheme so as to restraint coal merchants from selling bituminous coal in smokeless zones; this proposal, which has been welcomed by the Clean Air Council is current under examination by the Ministry and the National Coal Board.

"In 1956, the Black areas were designated as such because they suffered exceptional pollution. Since that time however greater quantities of smokeless fuel have been made available; thus it would seem appropriate to encourage the application of the existing provisions of the Act in the country as a whole, certainly in all urban areas.

"*We recommend*, therefore, that:

(a) the establishment of smoke control areas should become mandatory in the Black areas;

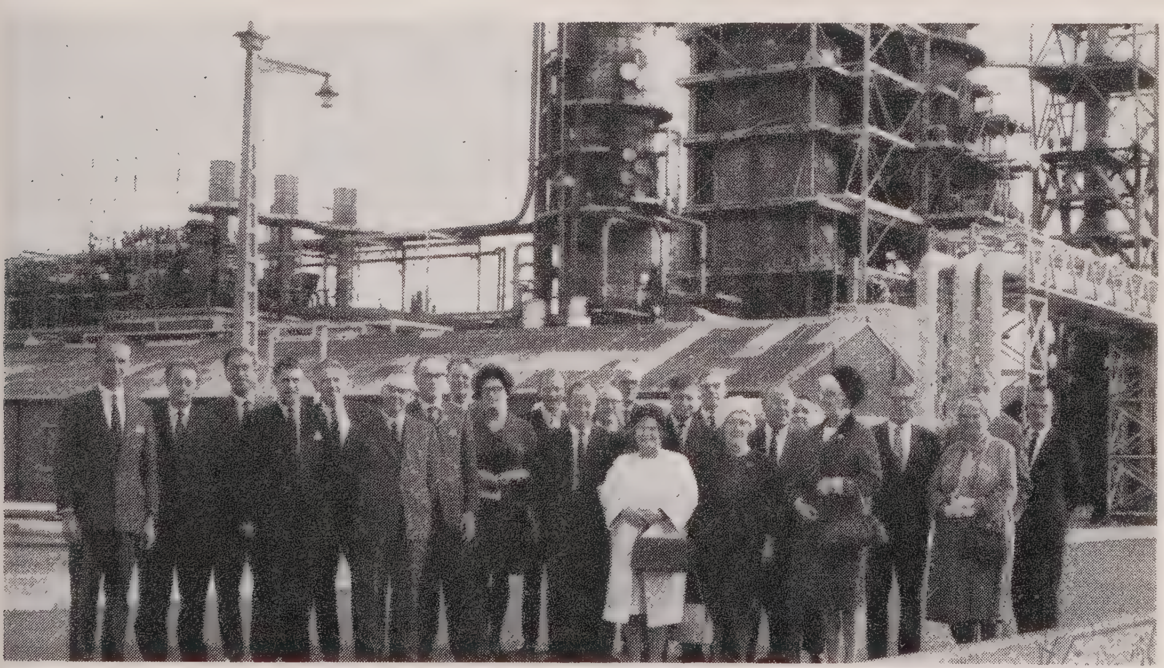
(b) the delivery of non-smokeless fuels in smoke control areas be made a statutory offence, or otherwise restrained, except for licensed appliances;

(c) selected urban authorities outside the Black areas, particularly those adjacent to Black areas (and in some cases partly responsible for conditions there), should be required to establish smoke control areas.

## Railways

Another point related to clean air and well worth quoting is on railways

"The low level smoke and also the noise created by railway trains has resulted in a preponderance of poor quality housing adjacent to railway lines and this often deteriorates into slums. As a result the view of the average town or city when seen from a railway train, is both squalid and depressing. The journey from Manchester to Birmingham is typical. As much of this type of property is due for replacement, *we recommend* that the authorities concerned should recognize the changed conditions resulting from electrification and rebuild to an entirely new pattern so that a rail approach to a town should impress and delight the voyager and reflect credit on the authority concerned."



*Members of the West Midlands Division, NSCA, during their visit to the Stanlow Refinery of Shell Refining Co. Ltd., on 11 October last. In the background is the Catalytic Cracking Plant*

# SMOKE CONTROL AREAS

## Progress Report

### POSITION TO 1 OCTOBER, 1966—TOTALS

| | England and Wales | Scotland |
|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation | 44 | 1 |
| *Acres*, 3,400 | | |
| *Premises*, 41,060 | | |
| **Smoke Control Areas in Operation** | 1,972 | 74 |
| *Acres* | 466,281 | 33,618 |
| *Premises* | 2,575,007 | 188,311 |
| **Smoke Control Orders** | | |
| *Confirmed* | 173 | 12 |
| *Submitted* | 119 | 7 |
| **Grand Totals** | 2,308 | 94 |

*The lists below are supplementary to the information in the last issue of "Smokeless Air" (Autumn 1966) which gave the position up to 1 July, 1966. They now show changes and additions to 1 October, 1966.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.*

## ENGLAND AND WALES

### NEW SMOKE CONTROL AREAS IN OPERATION

**Northern**

*Tyneside and Wearside*

Jarrow B. (No. 4) Wear Street. Newcastle upon Tyne C. B. No. 10. Whickham U. D. No. 4.

**Yorkshire**

*West Riding (North)*

Aireborough U. D. No. 19. Heckmondwike U. D. No. 5. Horbury U. D. No. 3. Huddersfield C.B. No. 10. Mirfield U.D. No. 7. Morley B. No. 33. Ossett B. No. 8. Sowerby Bridge U.D. No. 2.

*West Riding (South)*

Doncaster C.B. No. 8. (Wheatley) Sheffield C.B. No. 15. Swinton U.D. No. 10.

**North Western**

*South Lancashire and North-East Cheshire*

Ashton-under-Lyne B. No. 6. Baildon U.D. Nos. 4, 5 and 6. Bolton C.B. (Derby Ward Nos. 1 and 2) Bolton C.B. (Halliwell Ward) Bolton C.B. (West Ward Nos. 1, 2 and 3) Bredbury and Romiley U.D. No. 3. Cheadle and Gatley U.D. No. 7. *Droylesden U.D. No. 10. Manchester C.B. (Radnor St. Hulme) Manchester C.B. (Tamworth St. Hulme) Oldham C.B. No. 8. Sale B. No. 6. *Salford C.B. No. 8. Stretford B. No. 8. Swinton and Pendlebury B. No. 4. Whitefield U.D. No. 5C. Urmston U.D. No. 4.

*Central Lancashire*

Nelson B. No. 1. Preston C.B. No. 14.

*Merseyside*

Huyton-with-Roby U.D. No. 4. Kirkby U.D. No. 4. *Wallasey C.B. No. 11.

**Midlands**

*Derby, Nottingham and Chesterfield*

Beeston & Stapleford U.D. No. 7. Chesterfield R.D. No. 6. Ilkeston B. No. 1. Sutton in Ashfield U.D. Nos. 1 and 3.

**West Midlands**

Birmingham C.B. Nos. 121 and 122. Coventry B. No. 8. Dudley C.B. (Central) Smethwick C.B. No. 7. Solihull C.B. Nos. 8, 9 and 10. Stourbridge B. No. 20. Sutton Coldfield B. Nos. 6 and 7.

**London**

*Greater London Boroughs*

Barnet L.B. No. 1. Camden L.B. (St. Pancras No. 7) Camden L.B. (Hampstead No. 8) Ealing L.B. Nos. 22 and 23. Enfield L.B. No. 11. Hackney L.B. No. 10. Kingston- upon-Thames L.B. Nos. 6, 7 and 8. Merton L.B. No. 1. Merton L.B. (Old Merton and Morden U.D. No. 7) Newham L.B. No. 3. Redbridge L.B. No. 9 (Fairlop). Redbridge L.B. No. 10. Richmond-upon-Thames L.B. (Twickenham) No. 5). Richmond-upon-Thames L.B. (Richmond No. 7) Sutton L.B. No. 14. Waltham Forest L.B. No. 9.

**Local Authorites outside the Black Areas**

Basildon U.D. No. 4. Blaby R.D. (Glen Parva) No. 3. Chatham B. No. 3A. Crawley U.D. (Langley Green Neighbourhood) *Exeter C.B. (Cowick Lane No. 2) Exeter C.B. (Pyne's Hill) Exeter C.B. (Redhills and Exwick). Exeter C.B. (Salmon Pool Lane). Glanford Brigg R.D. (Bottlesford, Burringham) Hemel Hempstead B. (Warners End) High Wycomber B. No. 13. Luton C.B. No. 4. Oxford C.B. No. 5. Seaton Valley U.D. (Cramlington) *Skipton U.D. Nos. 2 and 3. Slough B. No. 9. Todmorden B. No. 4. Warwick B. (St. John's).

## NEW ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*

Hebburn U.D. No. 4. Tynemouth C.B. Nos. 1 and 2.

*Teeside*

West Hartlepool C.B. No. 5.

**Yorkshire**

*West Riding (North)*

*Bingley U.D. No. 13. Elland U.D. (Stainland No. 2) Brighouse B. (Slead Syke No. 11) Leeds C.B. No. 58. Aireborough U.D. No. 20. Baildon U.D. Nos. 7 and 8) Horsforth U.D. No. 22).

**North Western**

*South Lancashire and North-East Cheshire*

Cheadle and Gatley U.D. No. 8. Dukinfield B. Nos. 9, 10 and 11. Eccles B. No. 7. Manchester C.B. (Knott Mill) *Manchester C.B. (Withington) Prestwich B. No. 7A. *Rochdale C.B. (Buersil and Kingsway) Stalybridge B. (High Street, Set Street and Hollings Street.)

*Central Lancashire*

Brierfield U.D. No. 1. *Burnley B. No. 8.

*Merseyside*

Liverpool C.B. Nos. 22 and 23. Bebington B. No. 10. Ellesmere Port B. No. 7. Widnes B. No. 6.

**Midlands**

*Derby, Nottingham and Chesterfield*

Carlton U.D. No. 2A. Chesterfield R.D. No. 8. Derby C.B. No. 8.

**London**

*Greater London Boroughs*

Ealing L.B. No. 26. Hammersmith L.B. No. 9. Lambeth L.B. No. 18. Barnet L.B. No. 3. Bexley L.B. No. 7. *Croydon L.B. No. 8. Enfield L.B. No. 12. Wandsworth L.B. No. 1. Hillingdon L.B. No. 4. Redbridge L.B. Nos. 11 and 12. Waltham Forest L.B. No. 10.

**Local Authorities Outside the Black Areas**

*Exeter C.B. (Stoke Hill No. 1). Slough B. No. 10. Watford B. Cassiobury No. 5. Thurrock, U.D. No. 4. Todmorden B. No. 5. Skipton U.D. No. 4.

## NEW ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Tyneside and Wearside*

South Shields C.B. No. 1.

*Teeside*

Hartlepool B. No. 3.

**Yorkshire**

*West Riding (North)*

Bradford C.B. (Bierley) Halifax C.B. No. 13. Horbury U.D. No. 4. Horsforth U.D. No. 25. Huddersfield C.B. (Longwood-Gledholt). Leeds C.B. Nos. 59 and 60. Ossett B. Nos. 9B and 9C. Sowerby Bridge U.D. No. 4.

*West Riding (South)*

Darton U.D. Nos. 4 and 5. Sheffield C.B. No. 13.

**North Western**

*South Lancashire and North East Cheshire*

Denton U.D. No. 9. Droylsden U.D. No. 11. *Leigh B. No. 4. Leigh B. No. 5. Manchester C.B. (Liverpool Road). Oldham C.B. No. 9. Rochdale C.B. (Healey and Syke). Stalybridge B. (Mottram Road). Whitefield U.D. No. 6.

*Central Lancashire*
Darwen B. No. 2. Nelson B. No. 2. Preston C.B. No. 16.

*Merseyside*
Birkenhead C.B. (Area No. 5, Upton). Bootle C.B. No. 8. Litherland U.D. No. 1. Liverpool C.B. No. 24. Wallasey C.B. No. 12. Warrington C.B. No. 10.

**Midlands**

*Derby, Nottingham and Chesterfield*
Nottingham C.B. No. 5.

*West Midlands*
Birmingham C.B. Nos. 128, 131, 133, 134, 135, 136, 137 and 138. Halesowen B. No. 25. Solihull C.B. Nos. 11, 12 and 13. Stourbridge B. Nos. 23 and 24. West Bromwich C.B. No. 16. Wolverhampton C.B. Nos. 10B, 11 and 12.

*Potteries*
Kidsgrove U.D. No. 11.

**London**

*Greater London Boroughs*
Barnet L.B. Nos. 4 and 5. Ealing L.B. No. 27. Enfield L.B. No. 14. Greenwich L.B. (Blackheath Park), Kensington and Chelsea L.B. (Redcliffe and Brompton 1966. Kingston-upon-Thames L.B. Nos. 9 and 10. Lambeth L.B. No. 19. Lewisham L.B. No. 22. Merton L.B. No. 4. Redbridge L.B. No. 13. Richmond L.B. (Barnes No. 8). Richmond-upon-Thames L.B. (Richmond No. 8). Tower Hamlets L.B. No. 1. (Stepney No. 7 area). Waltham Forest L.B. No. 11. Westminster L.B. (Reading).

*Outer London*
Dartford B. (Temple Hill South). Dartford B. No. 6.

**Local Authorities Outside the Black Areas**

Southampton C.B. No. 5. *Scunthorpe B. No. 6. Hazel Grove and Bramhall U.D. No. 2.

(*For Scotland, see facing page*)

## SUMMARY OF SMOKE CONTROL PROGRESS

**As at 30 September, 1966**

| (1) *Region* | (2) *No. of acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage* of total black area acreage in the region so covered* | (4) *No. of premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage of total black area premises in the region so covered* |
|---|---|---|---|---|
| Northern . . | 20,295 | 16·12 | 89,030 | 16·1 |
| Yorkshire and Humberside . . | 106,875 | 28·4 | 374,470 | 32·06 |
| East Midlands . . | 26,090 | 9·72 | 97,710 | 19·09 |
| Greater London . . | 167,635 | 51·26 | 1,478,065 | 56·0 |
| North Western . . | 112,280 | 27·99 | 512,595 | 30·1 |
| West Midlands . . | 53,085 | 21·32 | 227,375 | 21·62 |
| South Western . . | 5,050 | 19·17 | 18,105 | 12·15 |
| Wales and Monmouthshire | 45 | 0·01 | 650 | 0·15 |
| Totals (black areas) | 491,355 | 23·24 | 2,798,000 | 34·09 |
| Outside black areas (all parts) . . | 87,475 | | 302,213 | |
| Grand Totals . . | 578,830 | | 3,100,213 | |

* The percentage shown in columns (3) and (5) above are percentage of the total acreage and of the total number of premises in the black areas concerned. In practice it may not always be necessary for the whole of a black area authority's district to be covered by smoke control orders (*e.g.*, there may be some areas of open country).

# QUESTIONS IN PARLIAMENT

### Exhaust Fumes (Control)

**Sir Clive Bossom** asked the Minister of Transport whether the investigations in Europe and in this country are completed on the best method of controlling exhaust fumes; and when she will introduce new regulations to require manufacturers to fit anti-exhaust pollution devices on all new models.

**Mr. Swingler:** These investigations are still going on. Their results will be considered at an international meeting in Geneva next March. My right hon. Friend cannot yet say when any necessary regulations on exhaust fumes will be made. Meanwhile, we are preparing a regulation to deal with crankcase fumes. (31 *October*, 1966.)

### Homefire Smokeless Fuel (Coventry Plant)

**Mr. Alison** asked the Minister of Power (1) at what capital cost the Coventry plant for the production of Homefire smokeless fuel was completed; on what date its building was commenced; and on what date it was commissioned or operational output commenced;

(2) what information he received, in considering the National Coal Board's application for approval of capital expenditure at the Coventry plant, regarding the forecast full production output of Homefire smokeless fuel from the plant per year, and per week, respectively; and when this output level will be reached;

(3) what has been the total output of Homefire smokeless fuel from production plants.

**Dr. Bray:** I understand that the National Coal Board notified the Minister of Power of its plans in 1963, and told him that the output of this plant was to be 650,000 tons per annum, 13,000 tons per week. Construction started in March, 1964. I am informed that the plant is now substantially complete, but that engineering difficulties have delayed the start of production, and full production is not likely to be reached for at least a year. The total cost cannot be stated exactly until all work has been finished, but the National Coal Board's latest estimate is that it will be of the order of £12 m.

Coventry is the only production plant for Homefire smokeless fuel. For the reasons given above it has not yet produced commercial quantities. (1 *November*, 1966.)

### NEW SOLID FUEL ROOM HEATER GIVES FULL CENTRAL HEATING

Radiation Parkray Limited have now extended even further their wide range of solid fuel room heaters with the introduction of the high-output Parkray 88PD model.

With the same outward appearance and finishes as the recently-launched range of Parkray 33, 66 and 77PD solid fuel room heaters, the 88PD is fitted with an extra high capacity boiler purpose-designed and shaped to provide full central heating with a maximum of up to eight radiators and a towel rail.

*Smoke Control—continued*

## SCOTLAND

(*From 1 April, 1966*)

### New Smoke Control Areas in Operation

Coatbridge (Kirkwood; Drumpellier and Blairhill). Dundee (Lochee). East Kilbride (West Mains). *Edinburgh (Murrayfield/Cremand No. 1). Falkirk No. 4. Fife County (Glenrothes No. 1). Glasgow (Cathcart Nos. 1 and 2). Lanark County (The Burnside (Part)). Stirling County (Larbert No. 1).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Dundee (Coldside). Glasgow (Pollokshaws* No. 2; Camphill; Langside; Govenhill). Port Glasgow No. 1.

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Coatbridge (Rosehall and Whifflet). Edinburgh (Murrayfield/Cramand No. 2). *Galashiels (Melrose Road; Langlee). Paisley (Millerston, Castlehead, Brodie Park). Grangemouth (Bowhouse No. 3). *Hamilton No. 1 (Hillhouse).

# ENERGY FOR THE NEW TOWNS

## *Conference at Harrogate*

The Combustion Engineering Association is to be congratulated on its enterprise in arranging, in collaboration with the Institution of Heating and Ventilating Engineers, and aided by the Ministry of Public Building and Works, a conference on this subject in the Hotel Majestic, Harrogate, in November. There was a very good attendance, mainly from the national fuel industries, manufacturers of equipment, government departments, consultant organizations, and building firms. There was only a sprinkling of delegates from local authorities and development corporations.

An opening address by F. B. Pooley, County Architect and Planning Officer for the County of Buckingham, outlined the basic planning concept in his proposals for a new town, which formed the basis for a Specification prepared by J. C. Knight of the Ministry of Public Building and Works.

The four energy supply industries then put forward their proposals for meeting the requirements of the Specification. N. C. Cartwright, of the National Coal Board, spoke on the disciplinary effect of the various services on the layout of the city, and urged that district heating should be considered with the same facility as other services. R. H. Phillips, of the Electricity Council, discussed the all-electric complex which presents a unique opportunity and challenge to apply advanced building methods. F. F. Robb, of the Gas Council, stressed in his paper the flexibility and adaptability needed in planning the energy system, and offered solutions by the use of gas both in conventional applications and by the concept of an all-gas city founded upon total energy systems. Finally, H. Roper and J. P. MacCarthy of Shell-Mex and B.P. Ltd., presented a paper discussing the various ways in which oil fuel could provide energy for the new town.

A summation and critique of the foregoing proposals, suggesting combinations of these methods, and others not mentioned, presenting the overall picture, was given in a paper by G. H. Buckle, of G. H. Buckle and Partners.

Papers were issued in advance, were merely summarized at the conference —except for Mr. Buckle's contribution —and were discussed in open discussion and in the group discussions that are a popular and valuable feature of the C.E.A. conferences.

# *Electric Central Heating*

## London Conference

The London Electricity Board held an interesting conference at the Royal Festival Hall from 15 to 18 November, 1966. The scheme of events was such that invitations to attend were spread over the four days, the programme being virtually the same each day, so that there was in effect a succession of small conferences rather than one large one. This has decided advantages. There were morning and afternoon sessions, those in the morning being on central heating in general, and those in the afternoon on "Electricaire Heating" and "The Complete Heating Service".

A small exhibition in conjunction with the conference was first-class in its presentation of the three methods being advocated by LEB for central heating: the familiar underfloor heating system; the equally familiar method using independent heat storage units; and the newer "Electricaire" system, in which warm air is ducted throughout the house from a single off-peak heater. Electricaire is a generic term and not a trade name, and the units are being manufactured by several firms. They are available with loadings from 6 to 15 kW and storage capacities up to 80 kWh.

# Clean air is automatic with clean electricity

**For clean air areas the most natural choice is clean electricity for all home and water heating. Electricity is the only fuel that causes no combustion in the home at all. Always there to be switched on. Nothing to store. Nothing to dispose of.**

## THREE ELECTRIC CENTRAL HEATING SYSTEMS TO CHOOSE FROM

Electric central heating is automatic, simpler and cheaper to install than other systems. One of them is bound to be suitable for a particular house. All run on half-price electricity. All, of course, comply with the Clean Air Act.

**Floorwarming:** Cheap to install at construction stage in new houses, built into the floor. Easily controllable, and economical to run.

**Electricaire:** Warm-air central heating with one thermal unit and ducts built into the fabric of new buildings, controllable room by room.

**Storage radiators:** The most easily installed and practical system for existing houses. Cheapest system of any to install. Wide variety of storage radiators to choose from.

## WATER HEATING, TOO

Electric water heating is extremely economical when a correctly installed immersion heater, or self-contained water heater is used. Various types are available, suitable for whole-house systems, or single-room installations. Your local Electricity Board will be glad to give any advice on heating problems caused by the Clean Air Act. Ask them for a copy of the free leaflet 'Smoke control areas . . . how electricity can help'.

ISSUED BY THE ELECTRICITY COUNCIL, ENGLAND & WALES

# A Continuous Automated Incinerator

## New Installation for Derby

*Refuse disposal can create air pollution problems, and while home incineration is to be discouraged (and becomes difficult or impossible for all gas or electric homes, and with district heating) large-scale municipal incineration is likely to grow. This demands highly efficient installations that can be operated without smoke or dust emission. The following account of a modern, technically advanced plant, to be built for Derby Corporation, is therefore important as an example of how the problem can be tackled.*

The County Borough of Derby, (population 132,000) like many other local authorities, has experienced serious difficulties in securing sites to allow the continuation of refuse disposal by the method of controlled tipping.

Some three years ago it became obvious that a permanent solution must be found to solve the problem of disposal of 46,000 tons of house and trade refuse produced annually by the Borough. The incinerator which is now to be built has been designed for a throughput of 210 tons of crude refuse daily and this should satisfy the present and future needs of the Borough.

The plant is scheduled to come into operation during 1968 when the existing tipping site is exhausted.

The decision to proceed with the scheme was made after the Council had made a careful appraisal of the many factors involved, when it was agreed that disposal by incineration was not necessarily the most economical, but it was the most hygienic method and offered an additional very substantial advantage in terms of volumetric reduction of refuse.

This latter point was considered of prime importance having regard to the newly established trend towards low density refuse and the steadily increasing amount of high combustible matter such as paper and plastic. Further, the traditional furnace designs currently in operation in this country were not considered acceptable and improved incineration techniques were required for the Derby plant, incorporating mechanically-operated grates designed to operate on the principle of 'total' incineration with a high degree of automation and burn-out.

Several organizations specializing in combustion engineering and refuse disposal plant design were invited to prepare outline schemes, and following an examination of the various proposals submitted, the Council decided that International Combustion Products Limited should be invited to proceed with the preparation of a detailed design. The class 'L' travelling grate stoker, with advantageous features in design and construction provides for reliability, low maintenance and high combustion efficiency with low grade fuels.

### Site at Raynesway Derby

Planning approval has been obtained for the development of a seven acre site situated in the South East of the Borough, and the building design has been given careful architectural treatment in relation to the surroundings.

The site is on an island encircled by the River Derwent and is located in an area zoned for industrial development, well served by road access from all parts of the Borough. The scheme includes a river bridge, access roads, ancillary buildings, and a Public weigh-bridge.

Naylor, Sale & Widdows have been appointed Executive Architects responsible for the Civil & Architectural design in consultation with the Borough Engineer and Borough Architect.

**Plant Guarantee**

Since the main purpose of the plant is to reduce all the refuse intake to an inert, non-combustible residue, the incinerator is designed to meet a performance guarantee that the residue will contain by weight no more than 3 per cent organic matter. It has been agreed that the determination will be made from a representative sample, obtained by a specified "on site sample procedure", ground in a Laboratory to pass through a 72 mesh B.S.S. sieve and dried in a vacuum oven for 4 hours at 120°C. An accurately weighed amount of the dried clinker to be heated in a muffle furnace at 400°C for 16 hours and the amount of organic matter in the clinker to be taken as the loss in weight at 400°C expressed as a percentage of the dried material.

So far as is known, this is the first occasion on which municipal incineration has been guaranteed to give a specific combustion performance and to this end, it has been necessary to engage in as comprehensive an analysis of the crude refuse as possible.

**Refuse Analysis**

During 1964 and 1965 in Spring, Summer, Autumn and Winter, a total of 1,320 dustbins from 1,120 houses of differing categories and representing approximately 14 tons of crude refuse were collected and carefully picked-over by a team from the Derby Public Cleansing Department and measured for weight and bulk under the following headings:

Dust,
Cinder,
Vegetable matter,
Paper,
Rags,
Combustible Debris (comprising leather, linoleum, rubber, plastics etc.)
Non-Combustible Debris (comprising bricks, bones, glass, metal etc.)

At the same time, samples from each constituent were taken by International Combustion Products Ltd. Laboratory and examined for calorific value, proximate and ultimate analysis. Since the primary object of combustion is to cause chemical reactions between combustible materials and oxygen, this accurate determination of the chemical analysis assists in calculating the quantity of air required for combustion and the quantity of waste gas to be disposed of.

The information on weight, analysis and proportions of property were fed into a computer and for each season figures were determined which made it possible to conclude that the average annual calorific value was 4,280 B.T.U.'s/lb.

Reference to data kept by the Derby Department of Public Cleansing shows that domestic refuse represents only 85 per cent of the refuse problem, with the balance comprising trade refuse consisting almost entirely of paper and cardboard, together with a percentage of street sweepings.

Adjustment of the final mean analysis had therefore to be made to cover the burning of the total refuse intake. This resulted in the establishment of an annual average calorific value of 4,677 B.T.U.'s/lb.

Data obtained on the bulk basis showed that by a complete combustion process the total bulk of crude refuse could be reduced to approximately one-eighth of its original volume.

**Plant Design and Layout**

The installation is to be sited on land by the River Derwent, adjacent to and with access from the Raynesway section of the Derby Outer Ring Road. The river here takes a large Northern loop and is cut by a wide flood relief channel making an island site. The Architects brief was for the design of the complete layout of the approaches, works area and buildings accommodating the mechanical incineration plant and ancillary facilities.

Raynesway is a new industrial development area with some good industrial architecture and in view of the consideration that this project be treated as a modern industrial plant, the buildings are being given a treatment in sympathy with these surroundings.

A smaller site adjacent to Raynesway is planned as the entrance area containing the Weighbridge/Gate House where incoming refuse collection vehicles will have their load weights recorded before proceeding via the new steel bridge to the island site where the main plant and ancillary buildings are located. A bridge will span the 130 ft. wide flood relief channel and will be undertaken by the Borough Engineer. The main building is composed of several units and will be constructed in reinforced concrete. Because of the need for robust structure it has been treated boldly, giving positive emphasis to the component sections. All the internal finishes are designed to withstand hard wear and regular hosing down for cleanliness.

**The Vehicle Hall**

This is the refuse vehicle receiving area and it is approached from the elevated road. Advantage has been taken of the necessary height of the river bridge to carry the approach up to the Vehicle Hall at the 21 ft. level, by an elevated embanked road. It is approximately 95 ft. x 56 ft. overall with a shell concrete vaulted roof incorporating roof lights. Walls are glazed all round to give, with the roof lights, a high degree of natural lighting to the area. The plinth walls, floor and ceiling are treated to give smooth surfaces.

The refuse reception pit runs adjacent to the long internal wall and the whole of this length serves as the tipping bay. Suspended rubber curtains screen the vehicle hall from dust when the vehicles are emptied. This area will also serve as a site vehicle garage during non-working hours.

*A model of the Derby Incinerator Plant*

**Refuse Reception Pit**

The large refuse receiving pit running the length of the vehicle hall is of reinforced concrete and is approximately 21 ft. deep. This pit is arranged above ground level to avoid any problems from the high water table on the site. A door at one end provides access from the service roadway to facilitate periodic cleaning by a mechanical shovel.

Advantage is taken of the raised height of the Vehicle Hall to locate the Baling Area housing paper and metal baling presses immediately below. This will give facilities for sorting, pressing and storing separately collected waste paper, and the metal press will be for dealing with bulky metal objects which will be off-loaded from the vehicles before they tip into the Reception Pit.

The Plant House lies behind the Refuse Reception Pit. This has a shell concrete roof similar to the Vehicle Hall, at the 62 ft. level. There are various intermediate level operating floors of open mesh steel flooring. The three concrete roof shells are supported on perimeter reinforced concrete columns and the walls are of a lightweight vertical cladding material down to the 10 ft. high brick plinth walls.

The workshops, electrical switch room and sub-station are designed as a composite unit linked at ground floor level to one side of the plant house. This unit is a brickwork construction with a flat roof similar to the adjacent ancillary buildings. There are two workshops giving facilities for mechanical and electrical plant maintenance.

A service road encircles the whole of the main building at ground level, serving the clinker loading area, the baling shed and the service doors to the plant. A ramped loop links this ground level road with the upper access road adjacent to the river bridge.

In view of the future proposals for a river side walk, on the South bank of the river, the ancillary buildings comprising site offices, first aid room, mechanical stores, toilets, shower room and canteen have been grouped to act as a visual buffer between the walk and the clinker discharge end of the main plant building. These buildings, in brickwork, will appear in contrast with the bold concrete areas of the main building but are in sympathy with the general appearance of the larger structure. The whole of the site area around the buildings will be landscaped with grassed areas and new tree planting.

## The Incinerator Installation

The high capacity reception pit is designed to accept a total of 1,000 cu. yds. (+) of refuse without trimming, representing five-eighths of the maximum daily intake. This section of the installation includes the dust extraction plant to control the airborne dust problem and the automatically controlled mechanical handling equipment to convey refuse to the incinerator furnaces.

There are two main 7½ ton furnaces each equipped with an integral "Gaserator" furnace where animal carcasses, spring interior mattresses and other items not desirable in the main incinerator furnaces will be destroyed. Each of the main furnaces is fired by two Class 'L' travelling grate stokers, with single grates, these being arranged in tandem to provide primary and secondary burning units. The main furnace units each have a dust cooling chamber linked with the dust collector system, together with automatic submerged chain conveyor ash disposal systems to handle the discharge of ash, dust, clinker and non-combustible material.

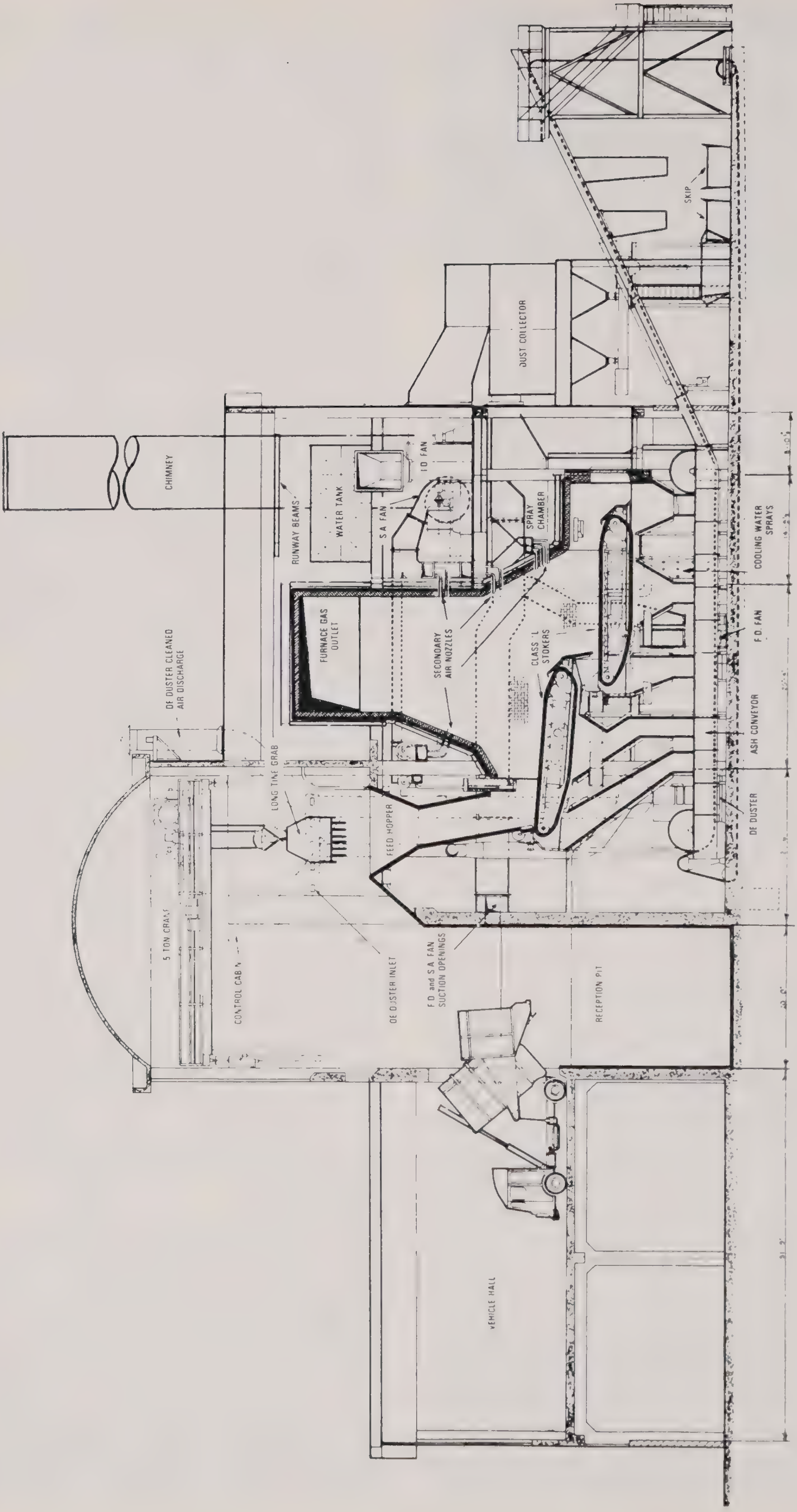
Refuse collection vehicles will discharge their pay-loads of crude refuse directly into the reception pit 95 ft. long x 20 ft. x 21 ft. 3 in. deep.

A high speed grab crane will traverse the reception pit and the five ton long tine grab, capable of gathering half ton of refuse per scoop, will additionally smash furniture and wooden boxes within the confines of the pit. The grab crane, with sufficient capacity to feed both furnaces, will be controlled from an air conditioned static cabin sited high over the reception pit and between the feed hoppers which it will charge at a total rate of 15 tons/hr.

From each furnace hopper refuse falls to the grate of the primary stoker through a chute, designed to avoid choking or bridging. Feed quantity to the primary stoker is controlled through a specially constructed shutter gate which can be adjusted to allow a depth of material up to a maximum of 4 ft. As crude refuse passes through the two furnaces ash residue and grate riddlings will fall to undergrate hoppers and then to two submerged drag link conveyors delivering to the outside of the building, into large skips which are automatically loaded on to special vehicles for conveyance to the tipping area.

In the "Gaserator" furnaces the high temperature gases resulting from combustion of the refuse will be utilized to burn up carcasses and other trade refuse unsuitable for the main furnace before entering the battery of cyclones for removal of the dust.

An induced draught fan will then convey exhaust gases to the steel chimney stack, which is refractory



SECTION OF THE DERBY INCINERATOR PLANT

concrete lined and externally clad with aluminium plate.

The plant will operate on a two-shift (8 hour/shift) basis and will be capable of consuming the daily intake of refuse in 14 hours, allowing one hour per day for starting up and another for shutting down. The basic labour requirement is four men per shift including one to operate the vacuum cleaning system operated from pick up points throughout the building. In the whole design of the plant and buildings, every possible consideration has been given to provide for maintenance of the cleanest possible working conditions.

### The Class 'L' Stoker

The tandem arrangement of the two stokers in each of the furnaces allows a drop of 7 ft. between the primary and secondary burner units.

Each stoker is driven through a self contained gear box arranged at the side and front end of the stoker. Power is transmitted from a motor shaft through an enclosed chain drive to a worm and wheel operating through a spur reduction to give a fixed ratio. The final drive of the stoker is by means of a worm and worm wheel arranged for direct coupling to the stoker front shaft. Stoker speed regulation will be variable between a maximum and minimum by the use of a wide range variable speed motor.

A salient feature of the Class 'L' stoker is the design of its grate surface. Each of the four stokers in the Derby incinerator has a grate strand made up of 2,772 independent firebars or louvres which are pivoted in holder castings attached to a row of endless driving chains. To form the grate surface, the louvres incline towards the front end of the stoker; when the point is reached where the grate travels over the rear shaft, the louvres overbalance and subsequently swing in a vertical position on the under-run of the grate strand. Agitation of the louvres is maintained on the under-run of the grate by means of skid bars which cause the louvres to be lifted and dropped, so that they rap against each other and so free themselves of any adhesions gained in their passage through the furnace. This feature also permits discharge through the bottom strand of all siftings which get through the grate surface and hence the machine requires no form of interior riddlings removal.

The Class 'L' stoker is a self cleaning travelling grate stoker and this is of extreme importance to the continuous burning of refuse since the air spaces never remain fouled by putrescible materials. Should any louvres get broken they fall freely on to the under-run of the grate and are automatically deposited in a safe position behind the stoker front shaft. A lost louvre does not impair the grate surface since the adjacent louvres further incline to fill the gap.

A further feature of this travelling grate design is that the louvres can be replaced in the grate surface even while the plant is in operation which is a highly desirable maintenance feature.

Forced draught is admitted to the underside of the firebed through a duct let to the intermediate riddlings hopper so that it first passes through and cools the under-run of the grate before passing into an air chamber. This has sufficient volumetric capacity, with no divisions so that the pressure is uniform throughout.

In order to distribute the air to suit the various requirements of the fuel bed, air valves are arranged in transverse rows immediately below the grate surface and each row of valves can be adjusted by levers projecting through the furnace side walls into the operating aisle.

### The Furnaces

Owing to the highly volatile nature of the material it is necessary to place considerable reliance on secondary air supply for the mixing of the hydrocarbon gases with necessary oxygen. For this reason a large number of secondary air nozzles are precisely positioned through the front and rear arches of the furnaces.

The total excess air quantity is gauged to obtain a gas temperature of 2,000°F since it will be utilized in the integral "Gaserator" furnaces previously referred to.

The secondary air nozzles are mainly banked along the rear wall of the furnace but a cross current from front wall nozzles, together with the specially designed furnace configuration will create a highly turbulent flame and hence intimate contact between the oxygen supply and the volatile hydrocarbon release from the burning refuse bed.

## Gas Cooling Chambers

Waste gases from the furnace are passed through mechanical dust collectors before passing to atmosphere via the 130 ft. high chimney. This will ensure that the plant meets the requirement of the contract, that dust emission should not exceed 0·35 grains/cu. ft. at N.T.P. Since there is little change in the gas temperature as a result of work done in the "Gaserator" furnaces it becomes necessary to cool down to an acceptable level before entering the dust collector system. Each incinerator unit thus incorporates a specially designed gas cooling chamber, situated immediately after the "Gaserator" furnaces, in which fine sprays of water issue from a battery of nozzles designed to pass a total quantity of 4,200 gallons/hour at a pressure of 175 p.s.i.g.

This quantity of water is rapidly evaporated and travels along with the gases which are now cooled to an induced draught fan handling temperature of 500°F.

A temperature sensing element is provided at the spray chamber outlet which controls spill valves in the water circuit to the sprays. So long as the gases leaving the spray chamber are below 500°F the spill valves will automatically open and allow a regulated quantity of water to by-pass the sprays and be recirculated. This continues during the initial warm up stages and at all times when the gas temperature is lower than 500°F.

A safety feature is embodied in the form of a high temperature thermostat situated at the inlet to the dust collectors. If emergency failure of the spray water pumps allows the waste gas temperature to rise much above 500°F, an automatic valve will be opened allowing 6,000 gallon water tanks to empty by gravity to the drench water sprays. These drench sprays are mounted in the upper section of the spray tower and as soon as they are brought into operation the fan motors and stoker drive motors will be tripped.

## Ash disposal

Ash, dust, clinker and non-combustible material is discharged from the stoker grates into a submerged chain conveyor. The material is then conveyed in a conditioned state and discharged into seven ton capacity containers suitable for lifting and transporting to the disposal area by road vehicles.

Two ash conveyors are provided, one for each furnace, and each is capable of handling ash at a rate of 4 t.p.h. at a chain speed of 6 ft./min. The chain is heavy duty De Brouwer twin strand type with suitably stiffened cross flights.

The section of conveyor beneath the stoker chutes runs in a horizontal 4 ft. wide cast iron trough filled with water and the stoker chutes dip into the water to form an effective seal. Expanded metal panels are fitted between the feed chutes and these are arranged slightly below water level in order to submerge floating debris. The water trough extends through the end of the building and the conveyor is then inclined upwards at the drive end where it is supported on a steel structure.

The inclined section of chain is supported in a mild steel trough and two hand winch operated gates are provided in the bottom of the trough for filling the containers. This arrangement allows one container to be filled whilst the other is being transported to the ultimate disposal area.

From the drive sprockets, the return strand of the conveyor chain descends vertically into a trench and continues horizontally below ground to the tail end of the conveyor. Provision for chain tensioning is made at the bend sprockets where the chain changes direction from vertical to horizontal. The trench housing the return strand is arranged to fall towards the tail end of the conveyor so that spillage from the chain can be sluiced down into a sump.

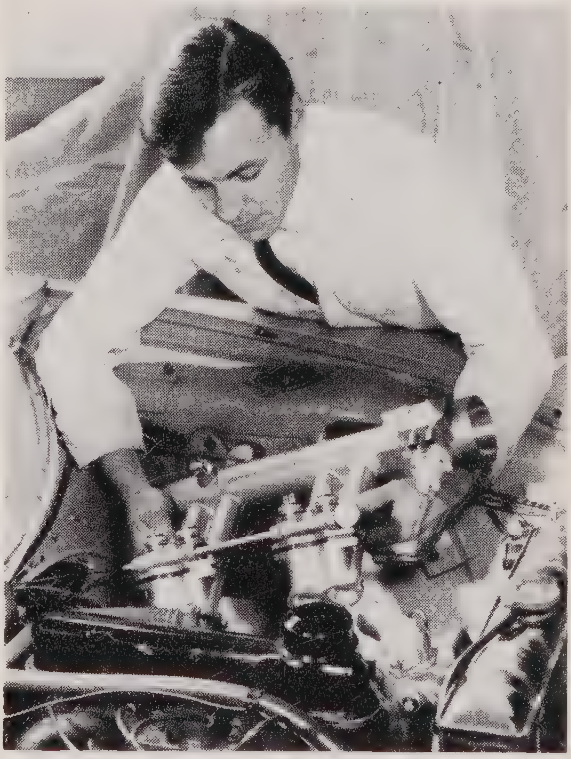
Trench covers are provided throughout the full length of the trench and these are heavy duty type over the section local to the container filling points.

# ELECTRONIC PETROL INJECTION SYSTEM

## *Can Halve Air Pollution*

Associated Engineering, the £50 m. engine components Group, announce a new petrol injection system which is the first developed and made in Britain that has electronic control. Designed primarily for building into an engine as original equipment, the system has already been applied to replace carburettors on a number of various conventional petrol engines. Reports from the British car manufacturers concerned have been very favourable, although at this stage none have yet completed the extensive trials that they will wish to make before coming to any decision on the adoption of the new system. Even better results will be achieved on future generations of engines that are designed specifically for fuel injection.

The A.E. injection system not only gives improved performance but at the same time also reduces petrol consumption by at least 10 per cent which represents a saving of 7d. a gallon. Running costs are minimal and apart from routine cleaning of the air filter and a replacement fuel filter every 12,000 miles, the A.E. system needs no up-keep and has been designed to run for at least 75,000 miles without attention. Solid state electronics as used in automatic landing equipment for aircraft have been chosen to ensure the system's complete reliability. When in quantity production the price should prove very attractive—especially in view of the saving in fuel—and should be well within the reach of the average motorist.



*Fitting the inlet manifold assembly of the new A.E. electronic petrol injection system to a four cylinder car engine*

The principal advantages of most fuel injection systems over carburettors are firstly improved fuel distribution —since each cylinder has its own injector—and secondly much more precise control of fuel over the wide range of conditions under which an engine must operate, *e.g.* cold start, warm-up, acceleration, over-run, etc. In the A.E. system five transducers or more are applied to the engine at vital points to measure the prevailing conditions and to feed the information into a cigar-box size computer.

This form of electronic control gives, under all conditions, more accurate fuel metering than the more conventional mechanical fuel injection systems, has a minimum of wear and hence loss of calibration, and has a very fast rate of response to changing fuel requirements.

From a safety angle, the system provides greater power output and acceleration which may be called for when over-taking, reduces driving fatigue as increased engine flexibility means less gear changing and has been designed using the most up-to-date electronics for complete reliability. It offers an important contribution to the problem of atmosphere pollution by petrol engine vehicles and will more than pay for itself by the 10 per cent saving in fuel.

The two main problems of exhaust emission are carbon monoxide and hydrocarbons. The first is poisonous and the second reacts under certain atmospheric conditions to form very unpleasant irritants that affect the eyes and throat (*e.g.*, the notorious Los Angeles smog). The A.E. system cuts down carbon monoxide emission by at least one-half and can reduce hydrocarbons by up to three-quarters, depending on the engine involved. A number of countries are in the process of drawing up regulations designed to control exhaust gas emission; the potential of the A.E. system to meet these requirements could have a special significance in the future, particularly in the export of British cars.

The A.E. electronic injection system has been road tested for nearly 200,000 miles and was developed over a period of five years at the Associated Engineering Group Research and Development Centre, at Cawston, nr. Rugby. It will be manufactured and marketed by Brico Engineering Ltd. of Coventry, an A.E. Group company (formerly The British Piston Ring Company).

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## ALKALI ACT

### *Consolidation Order*

Orders under the Alkali &c. Works Act, 1906, scheduling noxious and offensive gases and works subject to control, have been made on a number of occasions—in 1928, 1935, 1939, 1950, 1958, 1961 and 1963. A new Order (Alkali &c. Works Order, 1966, S.I. No. 1143; HMSO, 1s. 6d.) has now been made consolidating all the previous Orders and giving complete lists of all the gases, fumes and works affected.

Two only alterations are made to the list of gases, relating to fumes from paraffin oil works and to fumes containing cadmium. Two changes in the list of works concern those in which ammonia is used in the manufacture of nitriles, and amino works in which any methylamine or any ethylamine is made or is used in any chemical process.

**Letter to London Authorities**

Local Authorities in Greater London have received a letter from the Ministry of Housing and Local Government pointing out that supplies of gas coke for *future* smoke control orders cannot be assured.

In consequence, the Ministry advises Local Authorities that it would no longer be justifiable not to pay grant for the replacement of an improved open fire by an appliance capable of burning hard coke, or by an electric storage heater, gas room heater or fixed oil burning appliance. At the same time however, it is pointed out that grant should still be paid for the replacement of a coal fire by an improved open grate where the owner or occupier wishes.

# Electricity Forum and Symposium

## *Held in Conjunction with the Congress*

The Central Electricity Generating Board, and their Research Laboratory at Leatherhead, took the opportunity afforded by the International Congress to hold, first a forum on the Monday prior to the Congress, and a symposium at the end, on the Friday. The latter was combined with the visit of delegates from the Congress and is mentioned in the reports on the technical visits on another page.

The Monday forum, held at CEGB headquarters in London, was on "Clean Air Aspects of Electricity Generation", to which Congress delegates likely to be interested had been invited. The Forum was well attended by some 200 participants of whom about 40 came from overseas electricity undertakings and a similar number from national and international bodies whose interests included emissions from power stations.

There were three sessions, with a luncheon interposed. The first session was on "Policy, Planning, and Research". G. N. Stone, Chief Assistant to Station Planning Engineer, CEGB, was the opening speaker. Then came a session on "Design and Construction", opened by D. R. Berridge, Chief Generation Design Engineer, and after lunch a session on "Operations", with G. B. Jackson, Director of the North Western Region, CEGB, as the first speaker.

The proceedings were opened by a welcome from F. H. S. Brown, Chairman of CEGB, and were closed with an address by J. L. Ashworth, Member for Operations.

### Chimney Plume Rise and Dispersion

The symposium on Friday, 7 October, was held at the Central Electricity Research Laboratories at Leatherhead.

The occasion was chosen because it came at the end of the International Clean Air Congress which had attracted a large number of foreign scientists and pollution engineers to this country. In welcoming the delegates to the research laboratories the Director, Dr. J. S. Forrest, gave a special mention to the 35 visitors from overseas representing nine countries. There were about 80 other delegates from the Alkali Inspectorate, from the CEGB and from a large range of organizations interested in the scientific study of air pollution. The Director spoke of the difficulty of disseminating the ever-increasing amount of scientific information produced by the research laboratories of the world to those who wished to know. In order to avoid the delays associated with publication it had been decided to hold a symposium to announce research results which had not previously been published. The papers in the symposium described a very comprehensive research programme which had been carried out at Tilbury Power Station in which CERL had collaborated with the research staff of S.E. Region so that a full understanding of the behaviour of chimney plumes could be obtained.

The first paper, by D. H. Lucas, Dr. K. W. James and I. Davies, described the instrumentation which had been necessary for this project. Twenty-two $SO_2$ recorders had been placed in a predetermined pattern in a northerly direction from Tilbury Power Station. Meteorological instruments had been placed at six different levels on the 600 ft. Thames Crossing tower in order to measure the wind speed, the turbulence and the temperature pattern of the atmosphere which affected the behaviour of the chimney plume. In addition a new development—a plume height searchlight—

was used to measure the rise of the plume due to buoyancy since this was one of the most valuable and most controversial parts of plume behaviour. At a later stage the searchlight device had been supplemented by a device for the same purpose but using a ruby laser to emit pulses of light. These pulses of light were of extremely short duration (20 nanoseconds) but during the period of emission the peak power was 200 MW.

The second paper by Dr. D. J. Moore described the meteorological results which had been obtained and showed two interesting effects about which little information had previously been available. Firstly the turbulence of the atmosphere tends to decrease above 300 ft. and this means that plumes emitted from taller chimneys have a better chance to rise than plumes emitted from shorter chimneys. Secondly "stable layers" existed in the atmosphere within which the turbulence was unusually low. If such a layer occurred above the rising plume, it could somewhat increase ground level concentrations of sulphur dioxide. However, if it occurred at a lower level, it may be virtually impossible for the pollution from the plume to research the ground and ground level concentrations are made immeasurably small.

## Searchlight and Laser

The third paper by Dr. P. M. Hamilton gave the results obtained from the plume height searchlight and the laser. They showed that on average the plume rose for a considerable height above the chimney top and that with a 20 ft./sec. wind, for instance, the plume rose a height equal to the height of the chimney. He also showed that the results from Northfleet and Tilbury supported the plume rise formula published by CERL in 1963.

The fourth paper by Dr. D. J. Moore gave a thorough analysis of the very large number of measurements of sulphur dioxide ground level concentration and gave many diagrams showing the extent and the shape of the pattern of ground level pollution from the Tilbury Power Station and how this pattern varied with changes in wind speed and turbulence.

The fifth paper by R. A. Scriven gave a mathematical analysis of the situation where the atmosphere consists of two levels one of which is turbulent, the other being stable. He showed that the measured effects of stable layers on ground level concentrations could be explained by the mathematical analysis.

The sixth paper, by D. H. Lucas, gave the generalized results that had been deduced from all the experimental work. It showed that the formula for plume rise which had been published as a result of earlier work could be adjusted according to the height of the chimney from which the plume was emitted so that an estimate could be made of the higher plume rise which occurs from a higher chimney. It also pointed out that if a stable layer existed, a higher chimney would be more likely to benefit from the stable layer, whereas a lower chimney would be more likely to suffer from the stable layer, and that as a result higher chimneys had a further benefit. The paper also showed that if the highest concentration measured over three minutes was known the concentrations averaged over a day were only abont one-tenth as great, and concentrations averaged over a year were about one-hundredth as great.

During the day delegates were able to visit an exhibition showing chiefly the air pollution measuring devices which had been developed at CERL in recent years. These included instruments for measuring both sulphur dioxide and dust at some distance from the power station and instruments for measuring dust in power station flue gas before it had left the power station. Delegates were also very interested to have a working demonstration of the laser in the grounds of CERL.

# *Air Pollution Abstracts*

## Abstract Record of all Papers presented at the International Clean Air Congress, London, October 1966

*(Note: In a number of cases the Abstract is shorter than the summary as given with the Paper in the Congress Proceedings. Pt. I. To avoid unnecessary repetition, the usual reference after the name of the author is omitted, but in all cases is "Proc. Int. Clean Air Congress, London, 1966".*

### CONTINENTAL REVIEWS

**877. Continental Review: Africa.** Isaac, Peter C. G. Industrial pollution and pollution from road vehicles is growing in the developing countries, and in S. Africa a wide range of industrial problems has led to recent comprehensive legislation.

**878. Continental Review: North America.** Huguet, J. H. The report reviews the air pollution situation and outlines legislation and control in the U.S.A. and Canada. Future outlook and needs are discussed. It is considered that harder work has been put into creating sources of emission than in controlling them and that it is now time to clean up.

**879. Continental Review: South America.** Rispoli, J. A. The report brings together information received from Argentina, Brazil, Chile, Guyana, Peru, Uruguay and Venezuela.

**880. Continental Review: Asia.** Taga, Takahide. It is emphasized that conditions in the continent of Asia make the report unavoidably incomplete. It deals with the situation in Formosa, the Korean Republic, the Phillipines Republic, Thailand, India and Japan.

**881. Continental Report: Australasia.** Sullivan, J. L. Air pollution is mainly caused by industrial problems, although high sulphur coal in Christchurch, N.Z., creates a well developed domestic problem. Now New South Wales, the chief Australian steel producing state, with other industries, shows a higher dustfall level and smoke haze than do other states. Legislation follows the pattern of the British Alkali Act.

**882. Continental Report: Europe.** Roussel, A. and Stephany H. Statistics show that the worst air pollution is localized in the congested areas of middle Europe and that growing urbanization and industrialization create more emission sources. Necessary measures for the restoration of air resources, are recognized and a survey is given of European air pollution control legislation.

### DOMESTIC AND OTHER SPACE HEATING, PLANNING, ETC.

**883. Is Indoor Pollution a Neglected Variable in Air Pollution Epidemiology?** Biersteker, K. and de Graaf, H. A study which was made for 10 winter months in Rotterdam showed a significant correlation between $SO_2$ and mean mortality deviations. A study of the effect of low wind speeds on mortality deviations in the whole of Netherlands, demonstrated that wind speed alone was responsible for the correlation first thought to exist causally with $SO_2$. Since Rotterdam homes sometimes have much higher concentrations of air pollutants indoors than outdoors, this may be due to a so far not fully appreciated role which indoor air pollution can play in air pollution epidemiology.

**884. Oil Burners for Domestic Application; Present Design and Future Developments.** Gills, B. and Howe, E. L. A review is made of published work concerning malfunctioning of domestic pressure jet burners and some of the causes of poor performance are given. Recent developments with the objective of improving the combustion performance and reliability of domestic oil burners are described, together with references to research into methods of distillate fuel atomization, vaporization and combustion using novel principles.

**885. Progress in Air Pollution Control in South Africa.** Latsky, C. E. and Halliday, E. C. A brief review is given of steps leading to the appointment of a National Committee on Air Pollution in South Africa, the calling of a National Conference in 1960 and the promulgation of the Atmospheric Pollution Prevention Act of 1965. Implementation of the Act will be gradual; it largely combines provisions similar to those of the British Clean Air and Alkali Works Acts.

**886. Results of Sulphur Dioxide Measurements within the Air Monitoring Programme of North Rhine Westphalia.** Buck, M. and Stratmann, H. Report is made on the results obtained from measuring the sulphur dioxide immissions in Northrhine Westphalia since 1 November, 1964. As a result of this investigation, a list of places is given where unacceptably high $SO_2$ immissions have been found.

**887. Control of Smoke Emissions from Domestic Sources in Britain.** Street, J. H. The paper outlines the ways in which smoke pollution from domestic sources is dealt with in Britain.

**888. Tree Belts as a Protection against the Harmattan in Nigeria.** Molski, B. A. The air in West Africa is heavily polluted during the dry season by the haze of dust particles carried from the arid north by the "harmatten" which dries up the mucous membranes of the eyes, nose and throat. Being an unavoidable natural phenomenon, it is impossible at present to nullify Harmattan's effects completely, but it is possible to reduce their severity through afforestation.

**889. The Air Hygiene Problem in the German Democratic Republic.** Horn, K. and Knauer, A. As a result of increasing industrialization, the amount of atmospheric pollution has increased in the German Democratic Republic, the main pollutants (with brown coal the principal fuel) being dust and sulphur-containing gases. Domestic fuel-burning appliances also contribute considerably to air pollution, whereas the contribution of road traffic is still of secondary importance.

**890. Determining Source Reduction Needed to Meet Air Quality Standards.** Larsen, R. I. Air pollutant concentrations can be expressed as a function of location, averaging time, and frequency that a certain concentration is exceeded. Concentration data can be used with air quality standards to calculate the overall source reduction needed to meet a standard. The calculations can be refined to consider the effects of future growth, rural background concentrations, secondary pollutants arising from photochemical and other atmospheric interactions, and the contribution from each source.

**891. District Heating and Incineration in a Danish Town; Their Role in Reducing Air Pollution.** Iversen, N. S. Between 350 and 400 Danish towns are district heated. The towns in question have a population of between 1½–2 m. people. In the district heated towns the $SO_2$ contents in the air has been reduced by approximately 50 per cent, and the amount of soot and ash pumped into the air has also been reduced by approximately 50 per cent, when compared to a town without district heating. Beside the advantages of clean air the district heated towns are supplied with cheap and abundant heat.

**892. Standards of Emission under the Alkali Act.** Mahler, A. J. The paper stresses the necessity for considering heights of discharge of pollutants as well as their concentration in the emissions and mass rates of discharge to atmosphere. An outline is given of the principles adopted in arriving at the current standards, which are listed. In the author's view it will be necessary in the future to reduce emissions further, and because of the cost of such a step he suggests the setting up and adoption of international standards.

**893. The Air Pollution Situation and Special Problems in Finland.** Laamanen, A. and Noro, L. Owing to its favourable climate and a low population density Finland still has, on the whole, a clean atmosphere, but industrialization and urbanization are beginning to change this situation. This paper records and discusses the results of investigations and researches.

**894. The Application of Meteorological Data in Town Planning, in Relation to Problems of Air Pollution.** Boer, W. Only a drastic reduction of "specific emission" will finally solve the problem of cleansing the air. Meteorological data however, may be usefully applied to the solution of single problems.

## INDUSTRIAL PROBLEMS—GENERAL

**895. Analysis of Parallel Cyclone Operation.** Smolik, J. A main source of dust collection efficiency loss in bank arrangement of cyclones is a secondary flow through the dust discharge openings. The paper describes means for determining, by pressure and flow measurements and analysis, such secondary flows. The method of their evaluation is illustrated on a common type of cyclone bank.

**896. Control of Atmospheric Pollution on Existing and Future Sites of E.D.F. Power Stations.** Holl, R. E. Since 1959, Electricite de France has been engaged on air pollution control on the sites of existing and future power stations, in order to measure their effects on local pollution and to establish the critical periods when special fuels must be burnt. The studies refer to deposited dusts, high acidity content of the air and black smoke.

**897. The Fight against Air Pollution from E.D.F. Power Stations.** Debrun, G. The main features of atmospheric pollution prevention work undertaken by the E.D.F. since 1959, are shown. These are in the field of reduction in the emission of pollutants as well as in the ground immissions, by means of a better dispersion of combustion gases. Various controls effected on the sites of power stations in service, under construction, or in planning stage, are also described and some conclusions for the future are drawn.

**898. Some Industrial Problems arising from the Clean Air Act 1956.** Dickie, W. J. The Clean Air Act contains no reference to a standard rate of emission of grit and dust from furnaces and pressure has arisen for their formulation. Standards should be based on simple and inexpensive methods of measurement and the levels should be realistic. Wide-scale investigation is necessary before realistic standards can be determined for certain types of furnaces. Conflicting views in determining acceptable heights for chimneys by various authorities can in some cases restrict the choice of fuel.

**899. Air Pollution Control by Oil Refineries.** Termeulen, M. A. The activities of Stichting Concawe's Working Group on Atmospheric Dispersion are described. The major air-borne contaminants from oil refining operations and their sources are discussed, together with the general refinery practices for preventing or reducing emission of these contaminants. In conclusion, the general oil industries' views with respect to the air pollution problem are summarized.

**900. Air Pollution Problems associated with "Kraft" Pulping.** Hendrickson, E. R. and Harding, C. I. The Air Pollution Research Laboratory of the University of Florida has been investigating air pollution problems of the kraft pulping industry since the early 1950s. The paper describes the process by which kraft pulp is produced, the sources of pollutants, and the methods presently known for alleviating the air pollution problems.

**901. Control of Air Pollution from Phosphate Processing.** Hendrickson, E. R. and Lagarias, J. S. One-third of the world's phosphate is processed in Florida, where practically all the products normally made from phosphorus rock are produced. This results in a variety of pollution problems. The manufacturing processes, sources of pollutants and the general effects of the emissions, are described and procedures for alleviating the pollution are discussed.

**902. Clean Air and the Iron Foundry.** Archer, A. The paper describes some of the processes carried on in the iron-foundry that may give rise to air pollution problems. The operation of the cold blast cupola is discussed and reference is made to the absence of official guidance as to the best practicable means for reducing pollution. It is suggested that there is a need for standards relating to permissible emissions from foundry processes.

**903. Pioneering Experience with High Stacks on the OVEC and American Electric Power Systems.** Sporn, P. and Frankenberg, T. T. The paper deals with the pioneering features of the two OVEC plants with capacities of 1,200 and 1,000 MW. and 683- and 535-foot stacks. Dustfall and $SO_2$ concentration studies in the field began prior to operation and continued for three years after full commissioning of the plants. Experience obtained through these pioneer stacks led to modifications in the design of the 825-foot stack for Cardinal Plant, Ohio.

**904. The Problem of Maintaining Clean Air in a Zone Polluted by Waste Gases from Metallurgical Works.** Loszek, W. The technique for the prevention of air pollution at metallurgical works in Poland requires the almost complete removal of dust. The paper describes some of the methods used for measuring the concentrations of various pollutants, and discusses the significance of certain factors in assessing the efficiency of electrostatic filters.

**905. Polycyclic Hydrocarbon Ratios: Their Use in Studying the Sequence of Combustion in a Hand-Fired Intermittent Brick Kiln.** Cleary, G. J. Concentration ratios of polycyclic aromatic hydrocarbons have been used to study combustion in a hand-fired intermittent brick kiln. Soot samples were obtained at various stages in the heating cycle using a scroll-type high efficiency cyclone located at the base of the stack. The highest concentration of hydrocarbons coincides with the highest soot fall from the kiln. Two possible mechanisms are examined.

**906. Methods for Abatement of Air Pollution caused by Cement Plants.** Köhler, W. With the increasing cement consumption, the production plants of the cement industires are being enlarged. Various dust extraction plants are used in the industry, in which the various stages of cement production create considerable dust problems. The observance of the required limits of emissions not only are a difficult technical task but also cause considerable financial costs.

## INDUSTRIAL PROBLEMS—GRIT AND DUST

**907. Alleviation of Air Pollution in the Coking Industry.** Cooper, R. L. and Lee, G. W. The problem of air pollution at coking plants is the subject of investigation by the industry, its Research Association and the Alkali Inspectorate. Methods for mitigating smoke emission, dust and grit in the neighbourhood of coking plants are described. To enhance the industry's contribution to clean air, investigations are being conducted into the production of reactive oven cokes for the open grate and domestic boiler.

**908. Experiences with the Application of Wet Collectors in the Iron and Steel Industry.** Storch, O. The paper deals with the experiences of using several types of wet-collectors and describes a new type of Venturi wet-collector for separating particles below 1 micron in the metallurgical industries.

**909. Collection of Dust from Refuse Incinerators in Electrostatic Precipitators provided with Multicyclone After-Collectors.** Cederholm, C. Difficulties in collecting paper fractions in an electric precipitator are discussed. In order to find a solution to this problem, electrostatic precipitators have been combined with specially designed multi-cyclone after-collectors. Interesting trial results have been obtained from such installations now in operation in both Switzerland and Sweden.

**910. Dust Collection in the Cement Industry.** Tomaides, M. The paper describes briefly the main sources of dust nuisance in Czechoslovak cement works and specifies the usual, as well as the recommended, means of dust collection in this industry. The separating equipment is described and a mention is made of the newly introduced unit ventilating set and the mobile industrial dust exhauster.

**911. A New Dust Collector using Electrostatically Sprayed Water.** Eyraud, C. et al. A new dust collector using electrostatically sprayed water is described. Its efficiency is better than that of the Cottrell precipitator for the same volume of gas treated, the same size of electrostatic field and the same overall size of equipment.

**912. Collection of Dust from Oil-Fired Boilers in Multi-Cyclones and Electrostatic Precipitators.** Maartman, S. Since 1955 oil has become the predominant fuel in Sweden. The majority of oil-fired boilers in that country are equipped with dust collectors of multi-cyclone type, the operation of which is discussed. Electrostatic precipitators for oil-fired boilers have been installed since 1961 at Hasselby Power Station outside Stockholm.

**913. What Price Industrial Gas Cleaning?** Chamberlin, R. L. and Moodie, G. The paper describes four standard industrial gas-cleaning tools and explains their application to air pollution problems of the power, cement and steel industries. Cost studies are given of specific gas-cleaning plants for these industries, emphasizing the need to go beyond capital costs in choosing gas cleaning equipment.

**914. Dust Emissions from Coal-Fired Boilers in the Federal Republic of Germany.** Schwarz, K. Rigorous scales for the emission of dust from large coal-fired boilers have been evolved by the technical regulations in the Federal Republic of Germany. Experiment results over past few years indicate ever higher separating achievements.

**915. A Unique Regulation for the Control of Particulate Matter Emissions.** Sussman, V. H. The paper discusses with reference to Regulation IV of the Pennsylvania Air Pollution Commission: 1. weight-rate emission standards as opposed to concentration emission standards; 2. the methods by which these unique regulatory standards were developed; 3. methods for determining compliance with these regulatory standards.

**916. The Control of Fume from a Hot Blast Cupola by High Energy Scrubbing without Appreciable Thermal Buoyancy Loss.** Sullivan, J. L. and Murphy, R. P.

In order to overcome disadvantages of controlling hot cupola gases by high energy scrubbing, a recent installation has been designed and built in Sydney, Australia, in which heat is extracted from flue gas before scrubbing and re-introduced afterwards. This results in a hotter and drier plume which has no tendency to down-wash.

**917. High Temperature Glass Fabric Filtration of Noxious and Corrosive Dust Laden Gases.** Wright, R. J. Cooling hot corrosive gases is expensive and often leads to corrosion. Glass Filter cloth is corrosion-resistant and will stand temperatures up to 550°F (290°C). Glass bags are cleaned effectively by sonic waves combined with reverse air. Dust collectors must be operated well above the dew point and lagging is recommended.

**918. International Dust and Fume Collection Problems.** Schneider, G. G. Legislation in respect of dusts and fumes is causing new techniques to be devised in order to meet the required high standards. A general discussion of the international problem with representations in many countries, shows that the criteria for solving the industrial problems are yet to be established.

## FUMES AND GASES

**919. Towards Cleaner Diesel Engine Exhausts.** Pegg, R. E. and Ramsden, A. W. Although the diesel engine is widely thought to be a major contributor to atmospheric pollution, harmful pollutants are emitted only in low concentration. Exhaust smoke however, is a real nuisance and a potential safety hazard. The paper discusses the effects of diesel fuel composition on exhaust emission and the effect of diesel fuel anti-smoking additives.

**920. French Studies of Pollution by Motor Car Exhaust Gases.** Chapoux, E. and Delpeyroux, J. In order to study air pollution by motor vehicles and the efficiency of control devices, the U.T.A.C. laboratories have set up a standard road circuit in Paris. With the purpose of measuring the *total* pollutants emission of the car, an original measurement methods is used, which automatically proceeds to the summation of the contaminant quantities emitted during the testing. In view of proposed legislation, the laboratories have studied a sequence cycle on a chassis dynamometer. Research is outlined related to the critical study of smokemeters and to the designing of an improved type.

**921. Tomorrow's Town Transport—The Advantages of Electric Traction.** Irens, A. N. The use of all-electric transport is advocated as a means of solving air pollution from traffic in towns. Recent developments show that a battery electric passenger car could be built for about £450 with a running cost of 0.86d. per mile and future advances would give it greater range than at present. Longer journeys in and around the town would require other forms of transport such as the monorail and high-speed electric railway systems.

**922. Comparison of the Actions of Sulphur Dioxide and Fluorine Compounds.** de Cormis, L. Sulphur dioxide and fluorine compounds cause appreciable damage to the surrounding vegetation in many industrial areas of France. The absorption rates of the two polluting agents have been studied and the important difference between them is described.

**923. Analytical Problems Posed by Pollution by Fluorine Compounds.** Bourbon, P. The author sets forth the analytical problems posed by fluoride pollution and makes a critical study of the methods which are being used. He reports on the results that have been collected over several years.

**924. Fume Emissions from the Melting of Copper and its Alloys.** Jackson, N. H. The paper deals with fume emission from brass and copper melting and casting operations scheduled under the Alkali Act. The metallurgical operations involved are described and information given on the level of fume emission at various stages in the process. Work carried out by the British Non-Ferrous Metals Research Association is described.

**925. Atmospheric Pollution in Paris by Vehicle Exhaust Gases.** *Measurement of Pollution Levels and First Suggested Remedies.* Chovin, P. and Thiebault, R. Six years of study by the Municipal Laboratory of the Paris Prefecture have shown that the pollution was greatest at street intersections when the motor cars were stopped by traffic lights with the engines idling. A simple method has been discovered of adjusting the carburettor, already applied to large number of motorcars, which had the effect of lowering the rate of the carbon monoxide in the exhaust gases.

**926. Sub-Minute Continuous Nitrogen Dioxide Analysis.** Kothny, E. L. and Mueller, P. K. A study concerning the effect of chemical and physical variables on the response of a nitrite reagent is described. For performance comparison, an empirical parameter was developed.

**927. Sulphur Dioxide Concentrations Measured Around a Modern Power Station.** Gillham, W. F., Martin, A., and Barber, F. R. Two years of continuous measurements of sulphur dioxide concentrations around a modern 1000 MW Power Station, have shown that the ground-level amount of the gas from the station was only a small proportion of that from other sources. Measured concentrations did not reach the published critical dosage levels. Modifications to methods of calculation are proposed.

**928. Control of Haze and Odours from Curing of Plastics.** First, M. W. The process of curing plastics is outlined and the resulting haze and malodours represent a severe air pollution nuisance. Experiences with emission control by direct and catalytic combustion and by a number of water scrubbing devices are described and test data are presented.

**929. The Reduction of Carcinogenic Contaminants in Exhaust Gases of Petrol Engines through Fuel Additives and Choice of Lubricants.** Hünigen, E., Jaskulla, N. and Wettig, K. A quantitative analysis method for measuring 3, 4 benzpyrene in the exhaust gases of petrol engines has been used by the Berlin Institute of Hygiene. Investigations of the effect of fuel additives and lubricants which were carried out after the samples had been taken at comparable temperatures indicate that they make the 3,4 benzpyrene content practically disappear in the exhaust gases of two-stroke petrol engines, whereas this effect is obtained only in the beginning if the amount of lubricating oil is reduced, and hardly at all if the ratio is lower than 1:40.

**930. The Action of Gaseous Fluorine Compounds on Forest Species.** Bossavy, J. The examination of vegetation as the basis for determining air quality is considered by the author to require sustained attention, an acute sense of observation and knowledge of vegetable biology. It does however make it possible to place diagnosis of pollution—by fluorine (compounds) on a firm basis.

**931. An Efficient Method and Type of Device for Measuring, and a Proposal for Internationally acceptable Limits of Diesel Smoke.** Hünigen, E. and Sachse, J. A report is given on the results of an analysis of sixteen smoke meters. Trade and road transport require an internationally uniform method of testing. After a survey of existing regulations and measuring results, three limit values are proposed.

**932. The Catalytic Reduction of Nitrous Gases during the Manufacture of Nitric Acid.** Feist, J. Paper discusses a catalytic reduction process for reducing nitric oxide, present in the waste gases from nitric acid for manufacture, to a concentration of 100 ppm. The use of metal and ceramic catalysts is described.

**933. Towards a Clean Air Policy.** Clarke, A. J., Spurr, G. and Catchpole, S. Control of ground level concentrations should be the primary concern of a rational clean air policy. The principles applied by the CEGB to the control of smoke, dust and sulphur dioxide from power stations are described, with the single tall multiflue chimney being one of the recent advances.

**934. Present State of Development of Flue-Gas Desulphurizing Installations in North-Rhine Westphalia.** Oels, F. In support of the development of flue gas desulphurization installations by the State of Northrhine-Westphalia, dry processes are being preferred. The paper describes the various dry processes used.

**935. The Concentration of Carbon Monoxide Measured at Different Altitudes simultaneously in City Streets.** Georgii, H. W. The author draws attention to the diurnal variation in CO concentration associated with traffic volume and to the influence of wind speeds on dispersal. There is a difference in effect between the lee and weather sides of a street: whereas on the weather side a wind speed of 2/ms could produce a 50 per cent reduction in concentration, on the lee side a wind speed of 6 m/s was necessary to achieve the same result.

**936. California's Programme for Motor Vehicle Emission Control.** Grant, E. P., and Nissen, W. E. The paper gives a general account of the extent of air pollution in California and the measures taken so far to control it. It describes the investigations undertaken by the motor industry and the various devices that have proved to be effective in keeping the objectionable emissions under control.

**937. Some Theoretical Problems of Providing Less Toxic Operation of Automobile Engines.** Varchavski, I. L. The toxic components of automobile engine exhaust gases have different effects on the human organism, and the paper describes a formula for the determination of specific toxicity applicable to varying conditions. This makes possible the determination of the optimum regulation of an engine to reduce toxicity. (It was possible to publish only a summary of this paper in the Proceedings).

## RESEARCH AND INVESTIGATIONS

**938. Smoke and Sulphur Dioxide in Great Britain: Distribution and Changes** Craxford, S. R., Clifton, M., and Weatherly, M.-L.P.M. A prelimary report on standardized measurements of smoke and $SO_2$ at a statistically-valid selection of 1200 sites in urban and other areas. The steady fall in smoke concentrations in urban areas of Great Britain since 1952 runs parallel with the fall of smoke emissions from the burning of coal, while there is a lower decrease of sulphur dioxide concentrations in the air for the country as a whole. Due to the higher coal consumption for domestic heating in the North, both smoke and sulphur concentrations were very much greater there than in the South.

**939. Study of Diffusion by means of a Hydraulic Analogy.** Vadot, L. The paper presents the results of a study of the phenomena of atmospheric diffusion by means of an inverted hydraulic analogy. The method has been found suitable for studying thermal uplift of plumes; the effect of temperature inversions on plumes; the effects of density, relief and turbulence and wake eddies due to buildings.

**940. Statistical Studies of the Emissions in Paris and the Department de la Seine.** Detrie, J.P. The paper reports on an intensive study of atmospheric pollution in Paris, conducted since August 1964, when new legislation was introduced to restrict the use of fuels of high volatile and sulphur content. In spite of a noticeable reduction in air pollution in 1965, it is not yet possible to decide upon the effectiveness of the new regulations.

**941. Effects of Air Pollution on Textiles, especially Synthetic Fibres.** Travnicek, Z. The results of work carried out at Brno are outlined, in investigating the effects on synthetic fibres of atmospheric pollutants, utilizing a smog simulator and an aerosol chamber. Data are presented on the agents found to cause damage, including $SO_2$.

**942. Carcinogenic Hydrocarbons in the Atmosphere of Osaka City.** Watanabe, H. and Tomita, K. During the two-year period from September 1963 to August 1965, local and seasonal variation in the concentration of benzo (a) pyrene in the atmosphere in the district of Osaka City was determined. Methods of measurements and concentration figures are given.

**943. Episodes of High Pollution in London, 1952–1966.** Waller, R. E. and Commins, B. T. There have been eighteen episodes of high pollution in London during the period, including two major ones, in December 1952 and December 1962. The highest concentrations of smoke, sulphur dioxide and sulphuric acid measured have been studied and a tendency has been found for the amount of smoke in relation to that of sulphur dioxide to decline during the 14 years of this study.

**944. The Alkaline Filter Paper Method for Measuring Sulphur Oxides, Nitrogen Dioxide and Chloride in the Atmosphere.** Kanno, S. A method is reported of measuring not only sulphur oxides, but also nitrogen oxide and chloride in the atmosphere, by employing filter paper previously immersed in potassium carbonate solution and exposed for a month in louvred boxes.

**945. Studies on Automatic Recording Apparatus for Measurements of Oxidants in the Air.** Suzuki, S. An account of two instruments for measurements of oxidants in air. The first depends on passing air through a filter paper impregnated with potassium iodide, the colour change due to the presence of oxidants being measured photometrically and automatically recorded. The second apparatus relies on passing the air through a solution of reducing agents in an indicating electrode, the potential difference generated between the electrodes being automatically recorded.

**946. Optical Methods in Air Pollution Research.** Diamant, W. The paper stresses the necessity of basic research into the mechanism of combustion and describes a photomicrographic method employing revolving mirrors allowing optical investigation of a liquid fuel jet under actual operating conditions. The method may also be applied to investigate solids in flue gases using dark ground illumination.

**947. Sources and Distribution of Air Pollutants ascertained by Stationary Recording of Gaseous Components.** Breuer, W. and Winkler, K. The paper deals with continuous measurement from fixed stations in the area of Cologne. Gas components —$SO_2$, $CO_2$, CO, $H_2S$, $Cl_2$, nitrous gases and hydrocarbons—are measured and, when associated with meteorological data, enable sources to be determined.

**948. Air Pollution Monotoring in Canada.** Ross, C. R. and Wilson, H. J. A general review of air pollution monitoring programmes in Canada, based on national, provincial, and municipal government with contributions from industrial groups. Some progress has been made in the improvement of techniques and uniformity of analysis and data processing machine techniques introduced.

**949. Development of a Manual of Methods for Ambient Air Sampling Analysis.** Kupchik, G. J., Thomas, M. D. and Hendrickson, E. R. Attention is drawn to the need to standardize methods of measuring and evaluating air pollution. With this end in view, seven professional bodies and the U.S. Public Health Service are co-operating in a critical study of the methods now in use. Fifteen hundred methods have been indexed and thirty methods written up; eventually one of them may receive approval as a "standard method".

**950. Measurements of Concentrations of Particulate Pollutants in the Ruhr: Technical Experiences and Comparison with Results from other countries.** Friedrichs, K. H. and Brockhaus, A. Measurement of particulate matter should cover all the range of particle sizes found in the atmosphere. In three towns in North-rhine Westphalia, sampling has been carried out by gravimetric measuring method using a fine dust filter. The authors relate dust sizes to wind velocity and to the day of the week. Daily patterns of concentrations are not found by gravimetric devices, but by photometric evaluation.

**951. The Sulphur Dioxide Concentration in Mexico City.** Bravo, A. H. and Viniegra, O. G. The sulphur dioxide concentration in Mexico City was measured during 1962-3 using the Lead Peroxide Candle Method. Wet sampling was carried on at two sites during the two year period. The $SO_2$ concentrations obtained using these two different methods of evaluation are related to meteorological parameters, location of the industry and business areas.

**952. Effects of Meteorological Factors on the Stack Effluent.** Santomauro, L. A report on the first stage of an investigation in Milan in the lapse-rate trend as a function of wind oscillation and wind speed in the first 100 meters of the atmosphere. It has been established that when the time interval is 10 minutes, there is a change in the sign of average lapse-rate when the wind azimuth oscillation is about 5° and wind speed exceeds 5 m/s.

**953. Calculated versus Continuously measured $SO_2$ Concentrations with regard to Minimum Stack Heights and Urban Renewal.** Gräfe, K. An account of investigations of two particular stacks in Hamburg, illustrating the value of $SO_2$ wind rose techniques in evaluating the increase of pollution from a point source —in this case a district heating plant. A good correlation is established between calculated concentrations and concentrations measured continuously. A conclusion is reached that these formulae may be usefully applied to problems associated with determination of chimney heights, redevelopment and urban renewal. A further investigation deals with the indoor levels of $SO_2$ concentration compared with those in the outside air.

**954. Study of the Effect of Air Pollution upon Respiratory Diseases in London in the Winters of 1962-63 and 1963-64.** Carne, S. J. The paper records the results of studies carried out in London and Sheffield among patients, of general medical practitioners, suffering from respiratory diseases.

## STANDARDS, REGULATIONS LEGISLATION, INTERNATIONAL CO-OPERATION

**955. Control of Air Pollution in Great Britain.** Association of Public Health Inspectors. The history is traced of methods of control of air pollution, culminating in the Clean Air Act 1956 and of the control of pollutants by the Alkali etc. Works Regulation Act. The following are discussed: domestic air pollution control by local authorities; industrial pollution control both by local authorities and by the central government.

**956. The Operation of the Technical Committees of the Air Pollution Control Association (U.S.A.)** Lagarias, S., Mapston, R. T. and McCabe, L. C. The paper describes the operation of the Technical Committees of the Air Pollution Control Association and how the reports for publication in the A.P.C.A. journal are formulated.

**957. The Working Party on Air Pollution —European Federation of Chemical Engineering.** Gall, D. An account of the constitution, composition, aims and activities of the Working Party on Air Pollution, European Federation of Chemical Engineering.

**958. Organization and Efforts of Government Offices for the Preliminary Steps and Performance of Air Pollution Control.** Dreyhaupt, F. Steps taken in preventing air pollution from the concentration of heavy industry in the Northrhine-Westphalia area are outlined and the work of approximately 500 officials of the Works Inspectorate is described, in instigating and carrying out measures to keep the air clean, particularly in the steel industry, cement works, power plants and potteries. Report is made of measures taken to restrict emissions from industrial and domestic premises, waste incinerators and to establish a smog warning system.

**959. Air Resource Management in the Chicago Metropolitan Area Planning for Clean Air.** Stanley, W. J. The paper explores the many facets that were helpful in designing and implementing the City of Chicago's Five-Year Air Resource Management Programme and the progress to date. Existing control programmes are reviewed and attention is devoted to the methodology used to develop a successful air resource management programme.

**960. Clean Air Technical Regulation in the Federal Republic of Germany.** Oels, H. German Clean Air legislation is aiming at an optimal solution. It takes into consideration the knowledge that there is no sufficient protection against air pollution except by prophylactic measures. Thresholds have been prescribed for certain noxious substances, which are not allowed to be exceeded.

**961. Council of Europe's Activities in the Field of Air Pollution Prevention.** Adinolfi, G. The paper describes the Council of Europe's activities in the field of air pollution prevention. A resolution adopted by the Council on 29 March, 1966, created a committee of governmental experts charged with the task of preparing a working programme on air pollution matters, based on the results of the European conference on air pollution held in Strasbourg in 1964.

**962. Governmental Responsibility for Air Pollution Control.** Berg, J. The paper discusses governmental responsibility for air pollution control, with emphasis on enforcement and comparison between countries. Legislation has to be limited by available techniques for abatement control. The necessity for an international co-operation in clean air policy is stressed.

**963. Practical Measures in the Fight against Air Pollution in Paris.** Lameyre, G. and Fournier, M. The authors emphasize the importance of pollution from domestic heating and the need to consider invisible as well as visible pollutants. Correctly balanced combustion and the use of fuels with a low sulphur content among the practical measures that have been taken. The solution of any scientific problem depends on adequate measurements and the City of Paris has taken steps to equip a centre for the purpose.

**964. International Co-operation in Documentation and Terminology in the Field of Air Pollution.** Seidl, W. The paper discusses the rapid extension of technical and scientific publications, including the field of air pollution, in many countries of the world. International co-operation should be achieved in documentation and terminology or air pollution and possible ways of collaboration are suggested among institutions with similar interests.

## Solid Smokeless Fuels News

By mutual agreement of all the members, the British Coking Industry Association ceased to operate entirely from 30 September and the office at 74 Grosvenor Street, London, W.1, was closed on that date. Formal winding-up of the Association will continue and, it is hoped, will be completed by 31 December. An independent trust has been set up to continue its educational activities.

One of the main purposes of the Association was to help stabilize the coking industry during periods of rapid fluctuations in demand. The Association decided not to defend the agreement (known as the "sharing the burden" agreement) between members when it was referred to the Restrictive Trade Practices Court and it was discontinued on 31 October, 1965.

The members of the Association have been the National Coal Board, Steelmakers owning Coke Ovens, and Independent producers.

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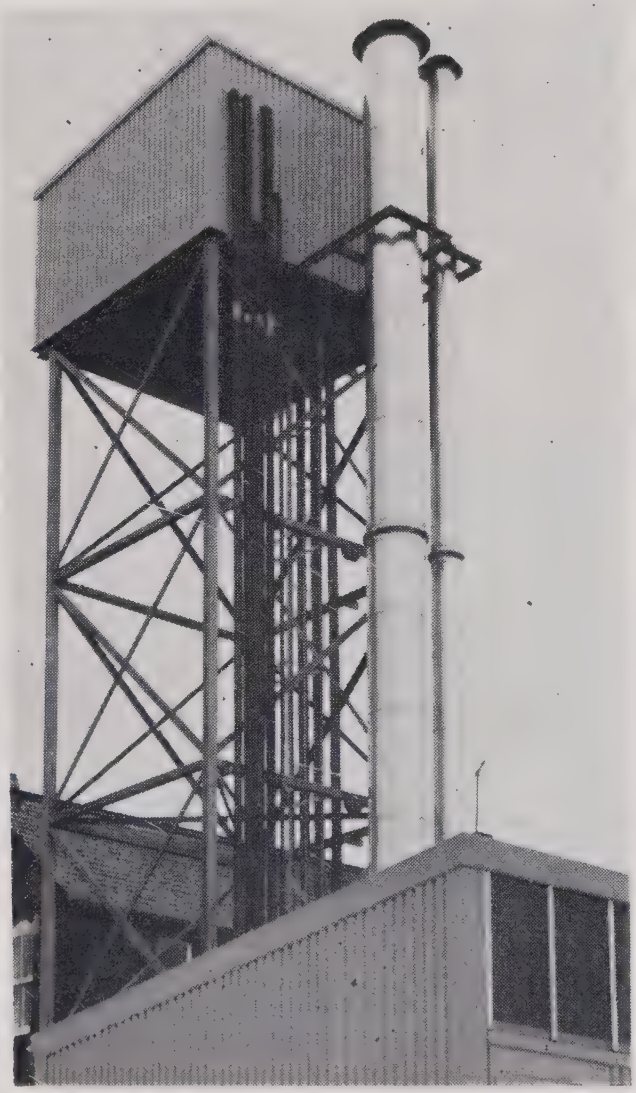

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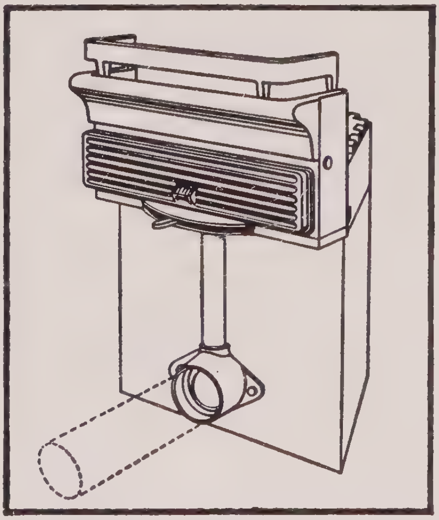

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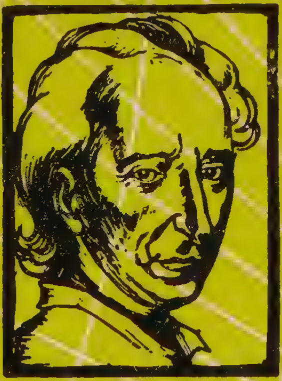

**No. 141 ★ SPRING 1967 ★ 3s.**

*In this Issue*

Sir Hugh Beaver ★ U.S. International Conference
Reports from Tees-Side and the North West ★ Emission from Incinerators
Air Pollution and our Technology ★ The State of our Atmosphere

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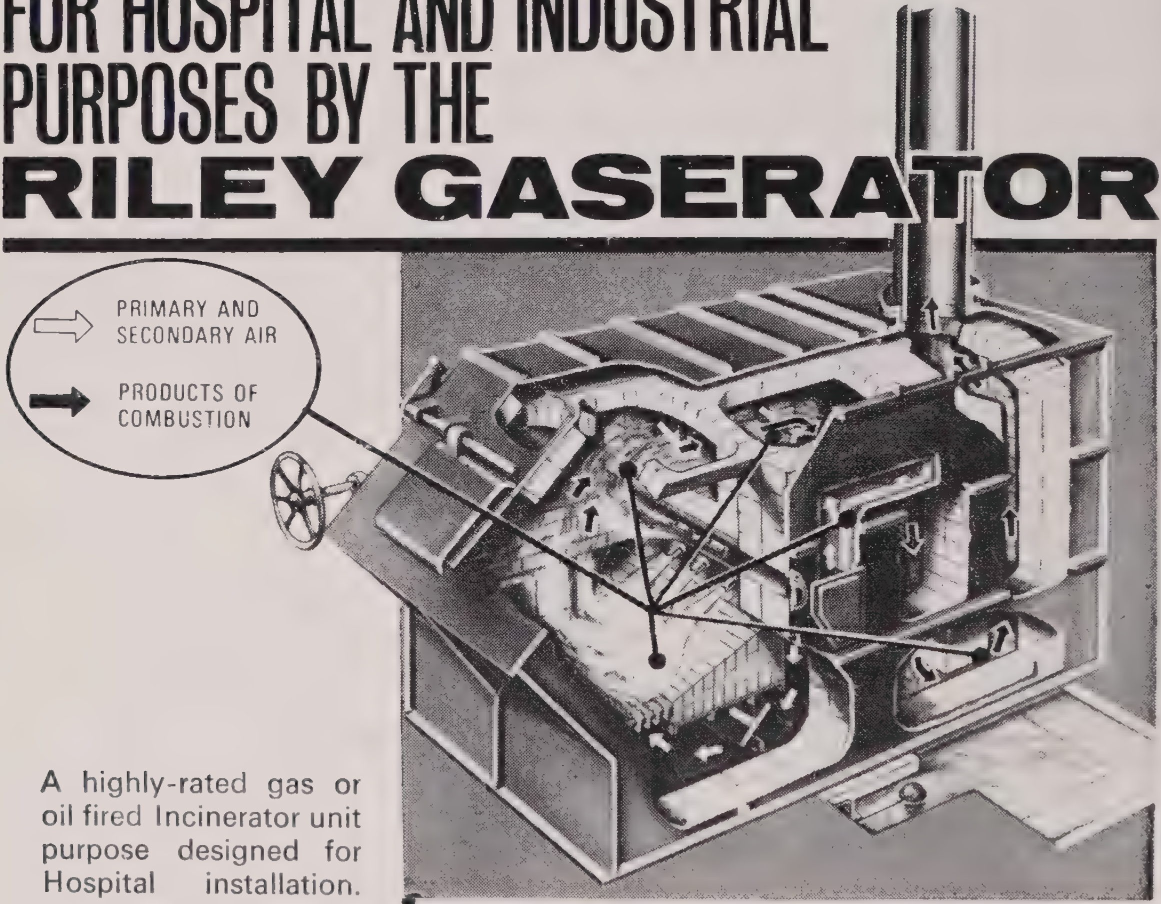

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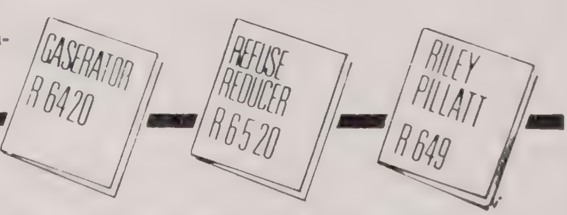

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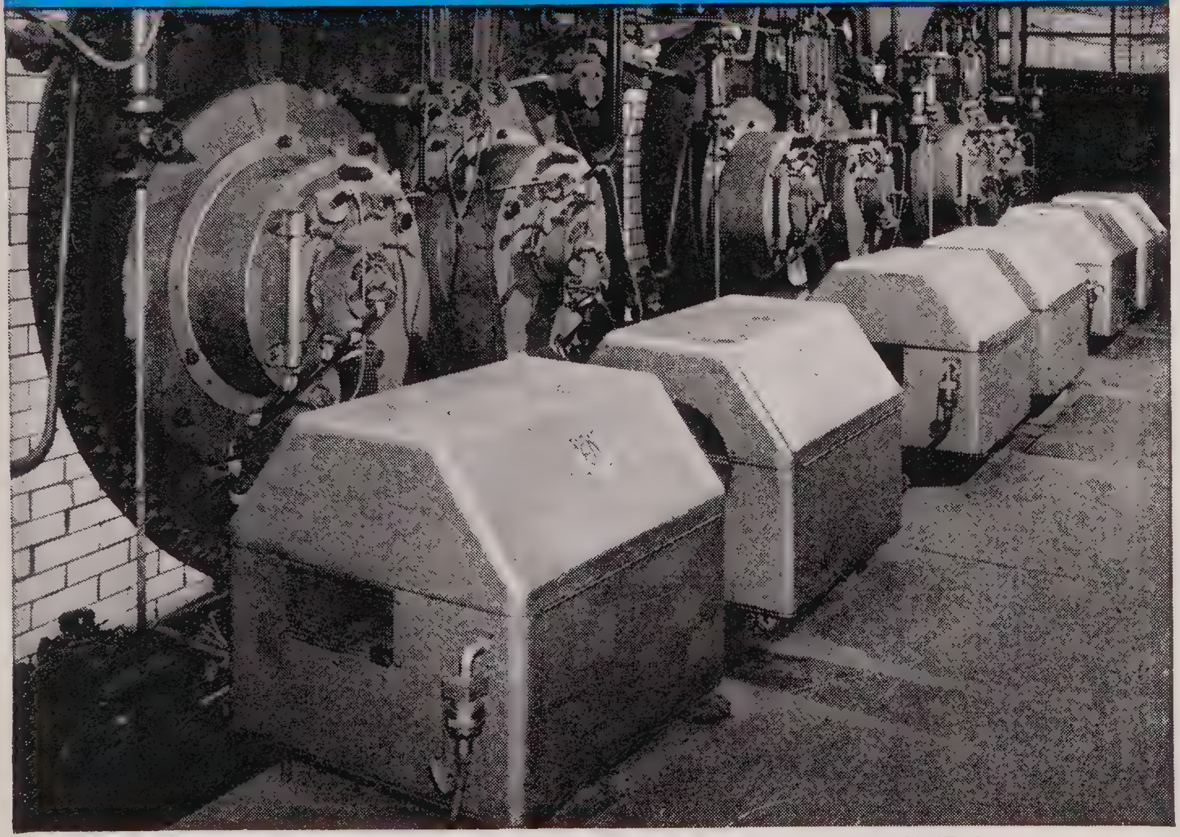

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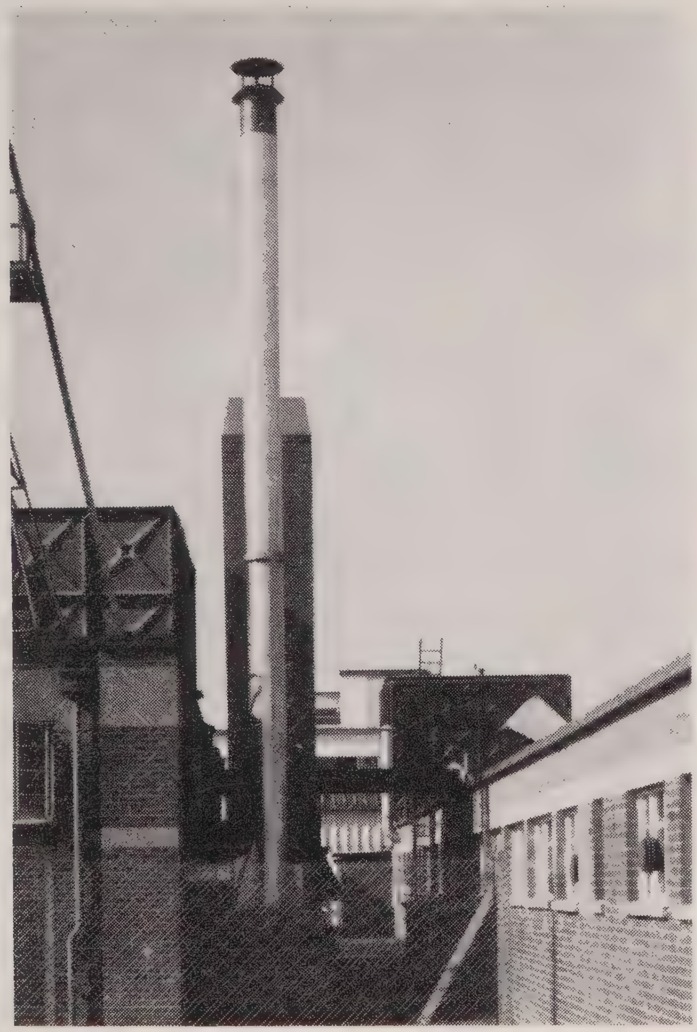

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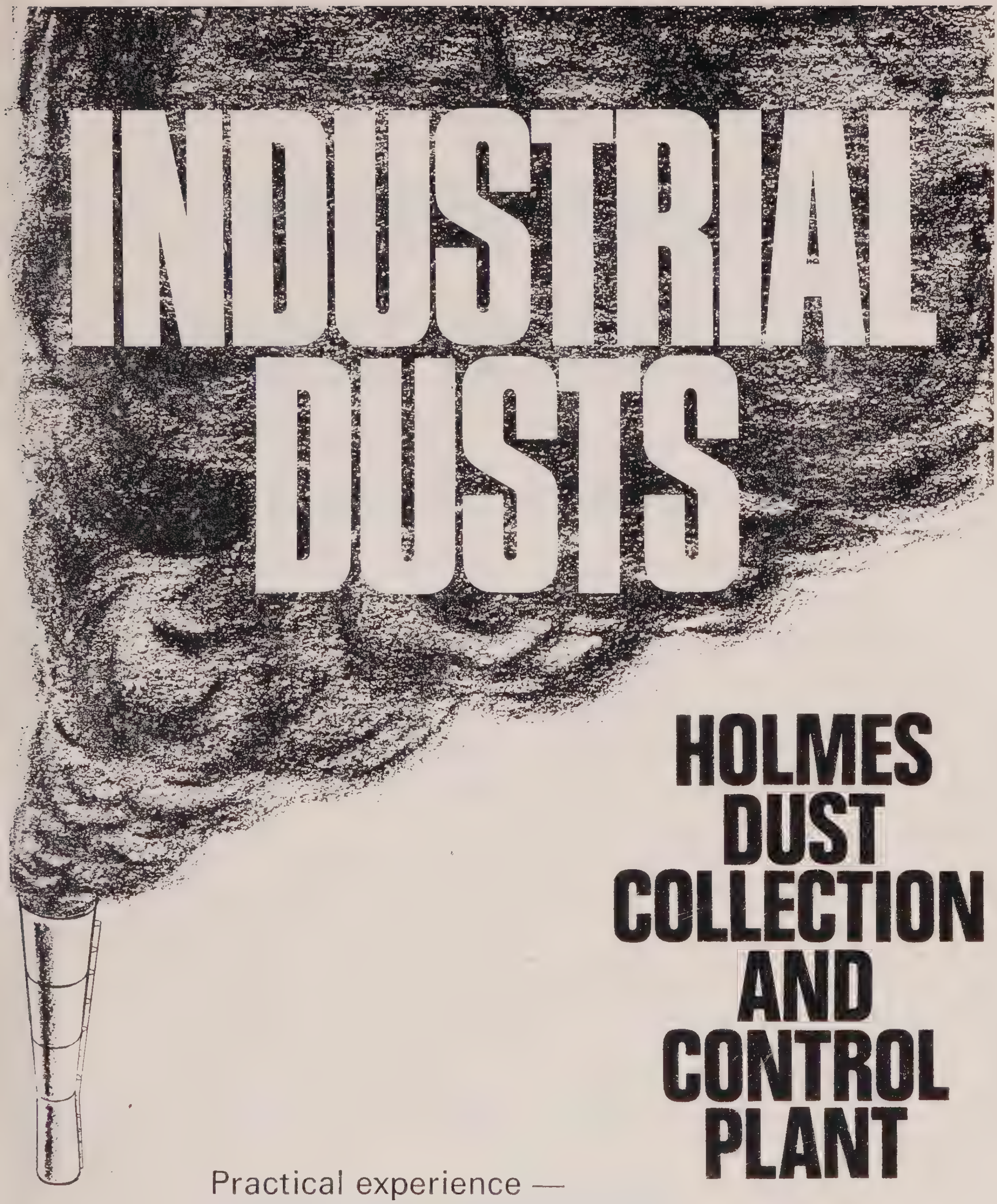

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MEMBERSHIP of the Society is invited and is open to individuals, local authorities, firms and other corporate bodies. Full details and membership application forms will be sent on request.

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## Meeting and Luncheon, Tuesday, 2nd May, 1967

Following the Annual General Meeting of the Society there will be an open meeting, at 12 noon to be addressed by

**REGINALD FREESON, M.P.**

*Parliamentary Secretary, Ministry of Power*

Mr. Freeson will also be the Principal Guest at the Society's Annual Luncheon (12.30 for 1.00). Tickets (32s. each) from the Society at Field House, Breams Buildings, E.C.4. Meeting and luncheon at the Connaught Rooms, Gt. Queen Street, London, W.C.2.

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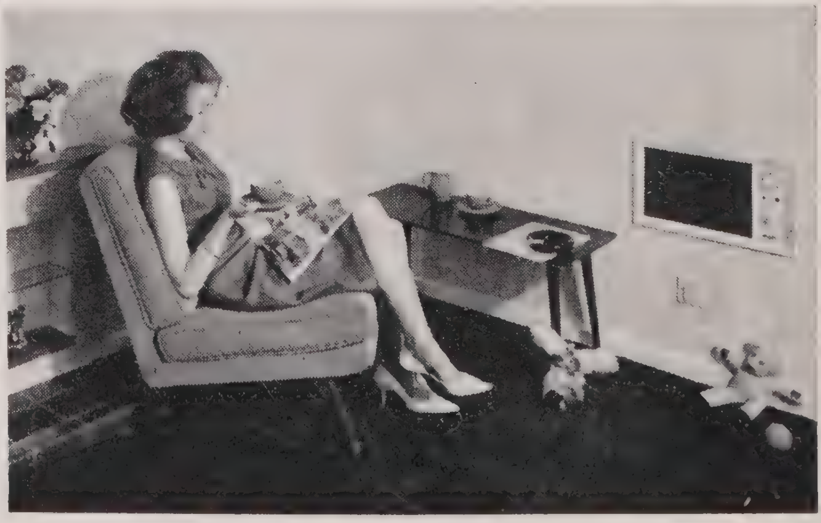

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# SMOKELESS AIR

Vol. XXXVII No. 141 Spring 1967

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: CHAncery 5038 (Editorial and Advertising). Editor: Arnold Marsh; Asst. Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SMOKELESS AIR only, 12s. per annum, post free.

SMOKELESS AIR is the official organ of the Society, but the views expressed in contributed articles are not necessarily endorsed by the Society. Abstraction and quotation of matter are permitted, except where stated, provided that due acknowledgements, including the name and address of the Society, are made.

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*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air.*

# SMOKELESS AIR

## *Home Affairs*

FOR a change we will start this page with news about the Society and its activities. Except for the International Congress *Proceedings*, both Parts I and II, referred to later, we can now devote full attention to our own programme of projects. First, there is the Annual General Meeting and Luncheon, to be held at the Connaught Rooms in London on 2 May. After the business meeting, at 11.30 a.m., there will be a short but important open meeting to be addressed by the Parliamentary Secretary of the Ministry of Power, R. Freeson, M.P. He will also be the principal guest at the luncheon to follow, and this occasion will also be marked by the formal transfer of the President's chain and badge by the retiring President, Sir Alan Wilson, to his successor. Strictly, we should not be able to announce the name of the next President until he has been duly elected, but this is a mere formality when it is known that it is to be Sir John Charrington. Sir John has done a great deal, more than is perhaps generally known, for clean air, and it is an honour to the Society that he has agreed to accept nomination.

The annual luncheon is becoming an institution with the Society, and is a valuable occasion for bringing members together and for showing hospitality to good friends. We hope that this year it will again be really well supported.

## *Conference*

Next on the programme comes the annual conference, to be held in Blackpool from 17 to 20 October. The programme is almost completed and it looks like being one of the most interesting conferences yet arranged. There will be the first Presidential Address by Sir John Charrington, and, for the first time for some years, a Des Voeux Memorial Lecture. The lecturer will be F. E. Schumacher, who is well known in the world of fuel as an economist and statistician, and who can be confidently expected to give a stimulating, thought-provoking, and certainly witty address. His subject will be "Clean Air and the Future Energy Pattern in Britain".

Before the conference the Technical Committee will have completed and published the report of its study on road vehicle pollution, and a review and discussion of this will form the subject for the afternoon session on the first day, Tuesday. It is therefore appropriate, and we are pleased to be able to announce, that the conference will be opened on the morning of that day by the Parliamentary Secretary to the Ministry of Transport, Stephen Swingler, M.P.

It is expected that in the near future the report of the Working Party on Grit and Dust Emission (Clean Air Act, sections 5 to 9) will have been published, together with a Memorandum to local authorities from M.H.L.G This important subject must be discussed at the conference and we are glad to say that a discussion will be opened at another session with a paper by the Chairman of the Working Party, Donald Hicks, who is of course better known as Director-General of the British Coal Utilization Research Association.

There will, as usual, be a session on domestic smoke control, which is to be opened by a paper from A. R. Smith, whose book—or monograph—on air pollution for the Society of Chemical Industry we reviewed recently. Mr. Smith will be dealing with the economics of smoke control, and his views, looking from the outside in, as it were, are likely to promote a lively debate. Also in this session will be a report on an inquiry now being made by the Society into the smokelessness of new housing, and especially in the New Towns.

Another interesting and different session will be concerned with the North West and its environment. This will have as its background the report of the Environment Committee of the N.W. Economic Planning Council, which was reviewed in the last issue of the journal (p. 102), and will of course be concerned with the air pollution factor in the effort to improve the whole environment.

In another session some of the less familiar harmful pollutants, emitted from specific industrial processes, and to be the subject of a paper of special interest, the authors of which will be Drs. Bonnell and Lawther. Finally, there will be a set of papers on the problems of waste disposal by incineration, municipal and industrial, plus one on a new process of importance that started as a means of disposing steel scrap, but is being developed, as the fumeless "F.O.S." process, to becoming one of much greater importance in steel manufacture.

There will of course be social events of various kinds and on the Wednesday an opportunity to participate in a series of tours and technical visits that are being arranged. There will also be the Society's Clean Air Exhibition, which already looks like maintaining its high quality and range of interest.

## Jobs in Hand

The notes above mention two of the exercises in which the Society is at present engaged—the report on road vehicle pollution, and the inquiry into smokelessness in new houses. For the latter a short questionnaire is being sent to all local authorities, and we are hoping for a good response. What it will reveal remains to be seen. Another task being studied by the committees of the Executive Council is the preparation of a memorandum on the improvements to the Clean Air Act that were reported upon and discussed at the opening meeting following the A.G.M. in May, 1966. There are eight specific revisions which it is hoped to submit, with a reasoned case for each, to the Government. Some, we believe, are already in mind in government quarters, such as in particular making smoke control mandatory in all the designated "black areas".

## Whackers

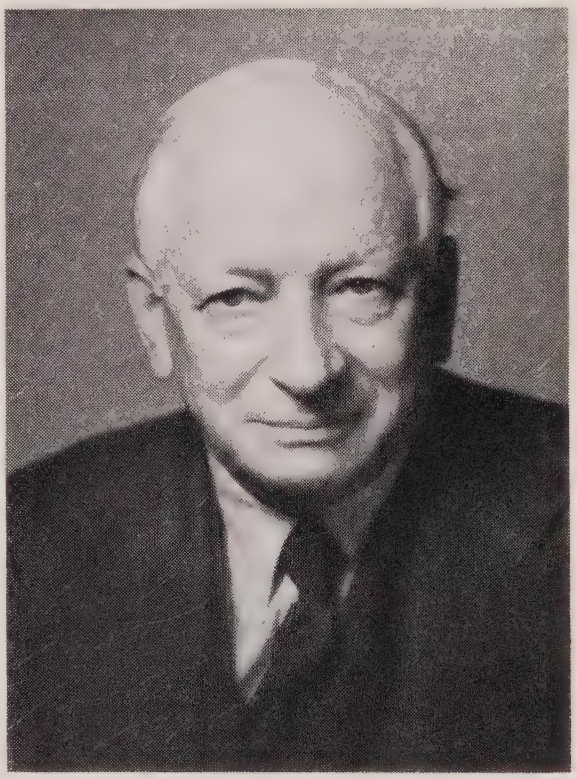
There are two developments of great importance to clean air much in the news at the present time, and news stories or comments upon them appear in the press almost daily. One is North Sea gas and the other the electric battery car. Although so very different from each other, each can make a substantial contribution to the prevention of air pollution, in both cases to an extent that cannot yet be predicted. On the day this paragraph is written news has come in of still another big gas strike off the Norfolk coast, described as "a whacker". And in addition to the news about the gas itself, there is much intriguing speculation about the price that will be paid for it.

As for battery vehicles, there is a spate of reports about different projects and possibilities. Thanks to the new legislation, research has been greatly stimulated in the United States, and although there still seem to be formidable problems to overcome in producing a low-weight, compact battery of high power, progress seems to be being made all the time, and really important breakthroughs seem possible at any time. As a *Times* leading article on the subject pointed out, "the increasing amount of money being devoted by manufacturers to research into these vehicles suggests that the technical and economic problems will be overcome". Equally important it continued, "there are signs that a comprehensive strategy for total movement in cities, without which novel ideas of this kind are unlikely to prosper, is at last beginning to emerge".

At the same time, work is proceedings on the potentially more efficient fuel cell, to which, it is reported, Chloride Electrical Storage (the Exide people) are devoting their time and money. One commentator adds that in the final count, "perhaps 25 years away, this alone is going to allow the electric car to take over completely from petrol".

## *Feet and Wheels*

Even better than electrical vehicles, in some areas, are no vehicles at all. The idea of the carless zone, or the car-free precinct, has been discussed before in these pages, hopefully thinking in terms of larger areas than are in fact appearing. But even small beginnings are to be welcomed, and they may grow as the community learns to appreciate the absence of traffic in shopping and recreational areas. The *Daily Mail* has had some good articles by its theatre critic, Peter Lewis, on the subject, and we hope the campaign will be sustained. Mention was made of carless areas being planned in Manchester, Bolton, Liverpool, Sheffield, Swindon, Guildford, Cheltenham, Southend, Aylesbury, Princes Risborough, and Marlow. As one supporter of the idea put it, "a long-term plan to separate feet from wheels must be given the highest priority".



*Obituary*

## SIR HUGH BEAVER

It is with regret that we have to record the death, on 17 January last, at his home at Crowborough, Sussex, of Sir Hugh Beaver. He was 76. The clean air movement owes much to him, and it will not be forgotten. It is true that he was in no way one of the pioneers, and in fact became concerned with air pollution only when he was appointed as chairman to the government committee of inquiry set up after the great London smog of 1952. In that capacity, and afterwards, he made an outstanding contribution to the cause of clean air. He led the committee with vigour and inspiration, its task culminating in its admirable report and from that the Clean Air Act.

Sir Hugh's interest in the problem remained; he became the Society's president, and he spoke at many meetings, which included some in the United States. The last occasion at which he was with us was, fittingly, at the annual luncheon last year, when the tenth anniversary of the Clean Air Act was commemorated.

Hugh Eyre Campbell Beaver had a full and rewarding life. His career began as a policeman in India, from where he returned in 1921 to become an assistant to Sir Alexander Gibb when he was establishing his firm of consulting engineers. During the war Beaver was at the Ministry of Works, as Director-General of Works and Buildings, and afterwards he joined, and later became Managing Director of, the firm of Arthur Guinness Son and Company—the geography of the Park Royal Brewery was familiar to him because he had designed it.

Sir Hugh's public services were varied and many. To mention only a few, he was at various times a member of the Reith New Towns Committee, a member and the chairman of the committee on Power Station Construction, of the British Institute of Management, and president of the Federation of British Industries. He was knighted in 1943 and created K.B.E. in 1956.

Sir Hugh had all the qualities that are called for in such positions of decision and authority, and for the leading of teams; including those by which as a person he will be best remembered: wisdom and kindliness.

---

## ORGANIC POLLUTANTS AND CARCINOGENICITY

*Nature* (17 Dec. 1966, p. 1305) published a paper of which the full title is "Carcinogenicity of Organic Particulate Pollutants in Urban Air after Administration of Trace Quantities to Neonatal Mice". The authors are Dr. Samuel S. Epstein, Dr. S. Joshi, J. Andrea, N. Mantel, Dr. E. Sawick, T. Stanley, and E. C. Tabor, from several laboratories, pathological departments, etc., in the United States.

The paper details research based on a new technique for observing the carcinogenicity of benzene-soluble polycyclic organic compounds in polluted urban air. A photodynamic bioassay was developed, using highly sensitive neonatal mice as subjects. The atmospheric pollutants were collected during 1963 from sites in Chicago, Cincinnati, Los Angeles, Philadelphia, New Orleans and Washington, D.C. After a year of treatment there was found to be, compared with controls, a high incidence of tumours of specific types.

A high incidence of hepatomata occurred in all the pollutant groups, with the exception of that receiving treatment from Los Angeles; it was highest with extracts from Cincinnati.

It is pointed out that there is little justification for assuming that the main carcinogens or classes of carcinogens in organic pollutants are restricted to the polycyclic compounds examined and measured. "It is likely that, apart from gaseous and inorganic components of atmospheric pollutants, which have not been considered here, there are also other classes of organic carcinogens, such as polynuclear azaheterocyclics, polynuclear ring carbonyls, aliphatic epoxides and alkylating agents, the importance of which cannot yet be assessed."

The paper concludes:

"It would take about 3–4 months for an adult human being in one of the cities considered to inhale the amounts of atmospheric pollutants which we have found to be highly carcinogenic to newly born mice. It is, however, difficult to make valid quantitative extrapolations to the human situation. For example, if the surface area rule for extrapolating between species applies here, an increase in the level of exposure by a factor of about 200 might be necessary to produce cancer when particulates are inhaled by an adult man. Nevertheless, it is difficult to escape the conclusion that the high carcinogenicity of trace amounts of organic urban atmospheric pollutants is highly significant."

# *INTERNATIONAL SECTION*

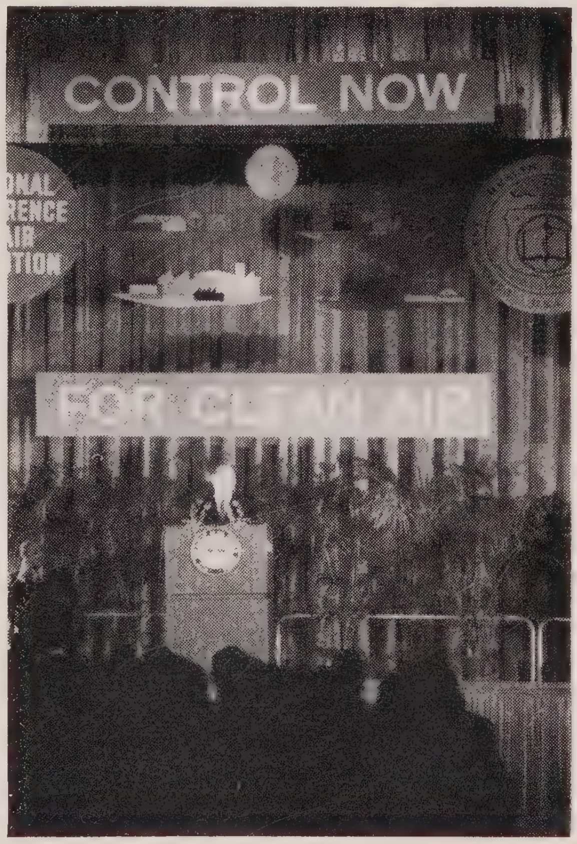
# *U.S. National Conference on Air Pollution*

HARD on the heels of the International Congress in London last October came the big National Conference in Washington, organized by the Public Health Service of the U.S. Department of Health, Education, and Welfare. Big is the correct descriptive word, as it attracted an attendance of over 3,000.

The conference took place in Washington, at the Sheraton-Park Hotel, from 12 to 14 December, 1966. There were two plenary sessions on the first day, panel sessions during the second day, and two more plenary sessions on the last day. The first day was devoted to welcoming and keynote speeches in the morning, and in the afternoon to addresses on "The State of the Atmosphere", "Air Pollution and our Health", "Air Pollution and our Technology", and "Air Pollution and our Welfare". The last was by a woman speaker, Esther Peterson, who is Special Assistant to the President for Consumer Affairs.

It was in the eight panel sessions held on the second day that the conference got down to grips with the technicalities of the problem. The subject titles of the eight panels are of interest to us in indicating the headings under which our American friends group their problems and (with the number of papers or reports in each panel indicated in brackets) they were as follows:

A. Motor Vehicles (9)
B. Heat and Power Generation (12)
C. Industrial Operations (13)
D. Solid Waste Disposal (8)



*Vice-President Hubert H. Humphrey opening the Conference*

E. State and Interstate Control Programmes (6)
F. Local and Regional Control Problems (5)
E. and F. jointly (3)
G. Role of the Federal Government (10)
H. Economic and Social Aspects (8)

The total number of panel papers was thus 64.

The opening session had high-ranking support from the U.S. Government. In the chair was Dr. William H. Stewart, Surgeon-General of the U.S.

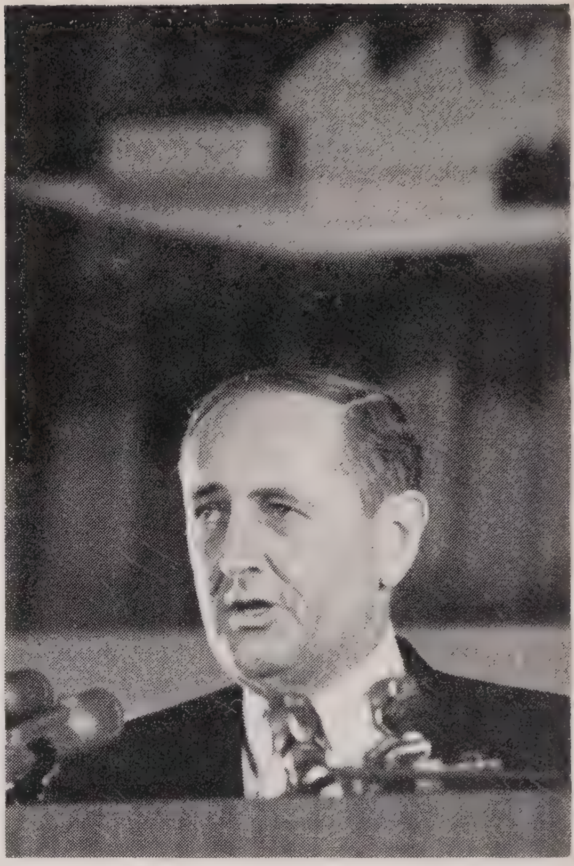
Public Health Service. An opening address was given by the Hon. Hubert H. Humphrey, Vice-President of the United States, while the "keynote speech" was by John W. Gardner, Secretary of the Department of Health Education and Welfare. A welcome to the delegates was given by Arthur C. Stern, who had acted as Executive Secretary for the organization of the conference. At a banquet the principal speaker was Edmund G. Muskie, U.S. Senator for Maine, who was chairman of the committee on air pollution that led to the passing of the Federal Clean Air Act.

### The Objectives

The programme of a conference tells much to distant observers, like ourselves, about its scope and nature, but does not necessarily tell us all we would like to know about the background, the objectives, the success, or the "atmosphere" of the event. Some guide is given by independent news reports, and we therefore quote from two of these. The first is from an article by Gladwin Hill in the *New York Times*, which has been reprinted as a leaflet by H. E. W. The article begins:

> "On 12 December the Department of Health, Education, and Welfare will convoke a national conference on air pollution. There have been similar meetings before, but this one will be something of a milestone.
>
> In essence, the gathering of public officials, scientists and engineers will tell the American people that they are exorably involved in a long arduous and complex campaign against creeping suffocation.
>
> "The conference," says John W. Gardner, the Secretary of Health, Education, and Welfare, "should help us insure that the air pollution problem, already serious, does not become critical in the decade ahead."
>
> The federally prescribed equipment to curtail auto fumes, which will raise the price of all 1968 cars about $50, is only a dot in an endless vista of regulation and readjustments that confront the public . . ."

A rather more critical report, written after the conference, was given in *Science News-Letter* (24 December), which began:



*John W. Gardner, Secretary of Health, Education, and Welfare, speaking at the Conference*

> "Two years ago the White House hardly knew there was an all out war on air pollution and the Air Pollution Control Division of the U.S. Public Health Service was limping along with an arsenal of only $16 million. Now, amidst pronouncements that we are losing ground in a campaign that was never really launched, President Johnson is laying the foundation for a massive—if not too costly—escalation of the battle against pollutants poured into the air by automobiles, incinerators and industry.
>
> The first move toward escalation came last week in Washington when 3,000 federal, state, local and industrial officials gathered to map out new strategy. 'Control NOW—for clean air' was the theme of the three-day presidential conference convened by John W. Gardner, Secretary of Health Education and Welfare.
>
> Vice-President Humphrey called for a working partnership between all levels of government and private industry, but implied he thinks

federal rule is the only road to success. Effective pollution control requires uniform standards, from state to state and city to city, he said.

Secretary Gardner injected a sense of urgency, of life and death hanging in the balance. 'People become sick and they die from breathing dirty air,' he said, and unless we put a brake on air pollution 'air pollution will put a brake on progress.'

But it was apparent that, if this were the opening skirmish, better plans still need to be laid.

None of the soldiers know for sure what direction the course of war will take when, early next year, President Johnson attempts to convince Congress he is moving toward cleaner air, convince the states he is not encroaching on their local power and convince industry he is not riding rough-shod over their concern with the cost of pollution control technology.

No one emerged as the principal strategist, although there were as many proposals as there were interests, and the total will make an enormous compendium from which the President will pick and choose.

Sulphur oxides, found wherever coal and oil are burning, nitrogen oxides and hydrocarbons that react with sunlight to create photochemical smog, and fly ash, particulate matter emitted in gases from fuels, are the main pollutants under attack."

### The Papers and Addresses

We have so far received copies of only press releases and a few of the papers presented, as separate preprints. The full report of the conference will be published in due course. In the meantime, one or two of the papers are reported fully on other pages, and below are given extracts from others. The information they give, or the viewpoints expressed may not always be so much of direct value to us in this country, as the illumination they provide of the American attitude to their own problems, and so give us a better understanding of the thinking—much of it new and interesting—that is developing in the States.

## PLATFORM POINTS FROM WASHINGTON

### Iron and Steel

The steel industry has spent $250 million during the past 15 years on air pollution control equipment, and will exceed this amount in the next five to ten years.

The industry is presently engaged in a programme of control which will make steel plants relatively free from major particulate air pollution problems by the end of the next decade.

It took 15 years for one of Bethlehem's shops in California to find an acceptable answer to satisfy the air pollution control regulating agency of that State.—*Allen D. Brandt, Bethlehem Steel Corporation.*

### The Cost of Pollution

Millions of people, without realizing it, are spending billions of dollars a year for air pollution. Estimates are that the economic cost to the nation is over $12 billion a year, or over $65 per person. Yet it has been estimated that the cost of control for each individual amounts to only a little more than 15 cents a year. This disparity between what is spent for control and the cost of air pollution to our economy is intolerable.

One of the hidden costs is in the use of expensive materials needed to resist corrosion of electrical contact points by air pollution. This means higher telephone bills.

Our food bill is higher, because processors of food have to spend more money to keep their facilities clean due to dirty air. The big cost, of course, is because air pollution destroys crops, damages the food for livestock, and even affects the animals themselves.

To quote O. Henry—"what a woman wants is what you are out of". Women are finding clean air more scarce; they want more of it."—*Mrs. Esther Peterson, President Johnson's Special Assistant for Consumer Affairs.*

### Fly Ash

Public utilities are doing more to reduce ambient air concentration of fly ash, an irritating pollutant, than industrial companies.

Total fly ash generation from the use of oil and coal fuel will increase from present levels to 36 million tons per year by the year 2,000. But emission into the atmosphere will decrease to about 1·4 m. tons by then. The reason for the decrease is due to the current practice by utility companies of retiring equipment older than 30 years and installing new equipment capable of 95 per cent fly ash removal. These companies expect to spend $314 m. for fly ash collection in the next 34 years.—*William W. Moore, Vice-President, Research-Cottrell, Inc.*

### Dire Prophecy

If present concentrations of pollutants continue to be poured into the air without controls, no human on earth will be able to exist.

We know that large fractions of pollutants remain in the air for periods of days or even weeks, during which they can be transported across state and national boundaries and even across oceans. No local political boundary forms a natural jurisdictional limit for air pollution control or regulation.

What is needed is a co-ordinated programme in which local, state, interstate, Federal and international agencies co-operate to maintain a healthful atmosphere.—*Dr. Morris Neiburger, Professor of Meteorology, University of California.*

### Fee System for Polluters

The Federal Government should put in a fee system if it wants to curb air pollution. The most effective way to fight air pollution is through the pocket book: charge the polluters for contaminating our air, and they will soon put a stop to it.

Metropolitan control authorities should be set up with the power to investigate and decide on the kind of control needed in their area. But local authorities would still need technical and financial help from the Federal government to establish the effluent fees. The Federal government must take the lead in finding ways to meter the discharges of major effluents, to predict their different patterns, and to measure their effects.—*Edwin S. Mills, Professor of political economy, John Hopkins University.*

### Motor Vehicles

Some limitation on the influx of motor vehicles into heavily contaminated urban areas is essential to control air pollution.

The U.S. Public Health Service, as a result of air pollution surveys, reports that gases originating from the 90 m. cars, trucks and buses cause half of America's air pollution.

The Secretary of Health, Education, and Welfare has been directed to set new standards which will go into effect for new autos. However, the problem is increasing more rapidly than the scheduled solutions. More stringent Federal standards are necessary. States have the power to limit the number of vehicles in use in their jurisdictions. Planning and implementation of these limitations should be made at once.—*Louis J. Fuller, Air Pollution Control Officer, Los Angeles County.*

### National Standards Needed

Nationwide emission standards are essential for effective air pollution control. Things would be a lot simpler for control officers and for plant engineers, if there were nationwide standards. Such standards would prevent competition by regions on the basis of "easier" or "harder" regulations. It is clearly a job for the Federal government.

On the economic aspects of air pollution, we should learn the cost of complete control and the cost of just meeting ambient air quality criteria; what the standard of control is available at 1 per cent of the product. or at 5 or 10 per cent of profits before taxes. This is necessary in order to establish a guide to sound financial planning and the establishment of comprehensive cost manuals.

Preparation of such cost manuals should be co-ordinated by the Federal Government with universities and research organizations. Professional and trade organizations should also be invited to make contributions. Final reporting should be extensive so that ultimate users may have all the facts.

The cost of air pollution to our economy has been estimated at 11 to 12 billion dollars a year. No cost figure, however, can be established in evaluating the health hazard to humans and the harm to our landscape. —*Dr. Seymour Calvert, Director for Air Environment Studies, Pennsylvania State University.*

### Factory Siting

Manufacturers must think of the public first when selecting locations for their factories. While the location of a factory site must consider the availability of and accessibility to raw materials, labour, power and water resources, plants should be located in areas where air pollution is controlled and where the problem is "not a political football".—*W. L. Faith, former Vice-President and Chief Engineer of the Air Pollution Foundation California.*

### Face to Face with Pollution

The American public will have to come face to face more often with the ugliness of air pollution before it does something about it.

The damage that foul and polluted air can do to an otherwise beautiful scene of nature will have to be experienced by a sufficient number of people before serious consideration is given to the problem. Urban dwellers who flee to the country for a breath of fresh air will be disappointed because air pollution does not terminate at the city limits.—*Dr. Spencer H. Smith, Citizens Committee on Natural Resources.*

### The Economics of Control

The cost of air pollution to the U.S. is at present incalculable. Estimates range between $4 billion and $11 billion.

We must arrive at some reasonably accurate cost estimate to satisfy two important needs: (1) the Federal government must know how much air pollution control will cost so that it can establish priorities for the national budget; and (2) the public must be told what it will cost to clean up the atmosphere.

In arriving at estimates, we have to break control costs down into three categories: (1) damage cost, such as effects on living things (humans, animals, livestock, plant); (2) control costs, such as control equipment, substitute disposal systems, use of mass transit systems in place of private vehicles; and (3) new technologies, such as cost of electric vehicles, moving sidewalks, and master waste collection and treatment centres.

Several cost estimating studies have been done. A comparison study between two cities, one relatively "clean" and one "dirty air" indicated a difference for air pollution control of $84 per capita in the studied year. An interesting sidelight of the study disclosed that income level was an important influence factor in arriving at the amount to be spent for air pollution in these cities.—*Dr. Allen V. Kneese, Director of Water and Envoronmental Studies of Resources for the Future, Inc.*

### The Citizen's View

The filth and grime that air pollution pours into man's environment can be halted by an aroused citizenry demand that something be done about the problem. Air pollution is causing many urban dwellers to flee to the suburbs, disrupting family life patterns and hurting the economic wellbeing of their communities.

Public opinion surveys indicate that dirty air is second only to poor public schools as a factor which drives young, middle-income people from our urban centres.—*Mrs. B. Brand Konheim, President of the Citizens for Clean Air, Inc., of New York.*

## OTHER U.S. NEWS

So many publications, papers, technical reports, press articles and cuttings, have flooded in from the United States during the last few months that it is not possible to do more than mention, very briefly, just a few items.

### U.S. Research Projects

The U.S. Public Health Service has issued a "Guide to Research" (82 pages) listing air pollution research projects. The number so catalogued is 501, and the estimated cost for the year 1966 for the work in hand was £11 m. 48 per cent of the projects were being conducted by universities, 30 per cent by federal agencies, and 11 per cent by industrial organizations, the remainder being state, local and private agencies. 80 per cent of the funds for 1966 were provided by federal sources.

The listing is in alphabetical order of States, but there is a very full index under subject headings. Four overseas projects are included by reason of PHS grants. They are in Austria. Canada, England and Sweden. The English entry is for the University of Birmingham, for research on the reduction of hydrocarbons during incomplete combustion.

### PHS Booklets

Timed to coincide with the Washington Conference, the Public Health Service has published a number of propaganda or educational booklets intended for the general public. They are informative, and some have colour and other illustrations of high quality and interest. Here we can only mention their titles: *Clean Air for Your Community*, *The Effects of Air Pollution*, *The Federal Air Pollution Program*, *The Sources of Air Pollution and their Control*, and *Today and Tomorrow in Air Pollution*. There is also the little volume of press cartoons on air pollution, mentioned separately.

There are also two reference publications that should be noted. First, a list of *Air Pollution Publications, 1963–66*. (pp. 144). Well over 2,000 publications are listed, under titles, with an author index. Secondly, and of value to anyone studying American legislation, is *A Digest of State Air Pollution Laws, 1966 Edition*. Included as an appendix is the U.S. Clean Air Act 1963 and the Control of Air Pollution from Motor Vehicles Law.

### Smoke Wardens

New York City is thinking of using a corps of citizen "Smoke Wardens" in its drive against smog-producers. Air pollution commissioner Austin N. Heller estimated that there were 17,000 incinerators in the city. Policing them, he said, created a "mammoth task" for his department.

"The citizens could help us," said Heller, "they could see to it that the incinerators are maintained properly". —*Press Report.*

### APCA 60th Conference

The Air Pollution Control Association announces that its sixtieth annual meeting will be held at Cleveland, Ohio, from 11 to 16 June, 1967.

### New Pollution Study

The *New York Journal of Commerce* reports a new study to determine the effect of various air pollutants being undertaken by the American Petroleum Institute.

For the first time, primates (in the form of monkeys) will be subjected to extensive testing to determine the effects of breathing low concentrations of specific pollutants. According to API, the programme has been designed to verify or negate speculations concerning the possible hazards of such pollutants as carbon monoxide, sulphur dioxide, a particulate sulphate, and an organic lead compound—singly and in various combinations.

### Sulphur Dioxide

Sulphur dioxide is one of the major causes of air pollution arising from coal and oil burning plant. A study recently completed at the Columbus (Ohio) Laboratories of the Battelle Memorial Institute suggests that the addition of powdered limestone to the flue gases could remove all but one part per million of the $SO_2$ produced.

The study involved thermochemical calculations to determine what reactions can occur in various furnace atmospheres and temperatures, kinetic studies to consider the rate-controlling features of these reactions, and analysis of the engineering problems.

One important conclusion was that the powdered limestone should not be added directly to the burning coal because the reaction with silica could cause serious fouling. The preferred point of addition appears to be where the fine gases enter the superheater and reheater sections. The limestone should be ground as fine as possible.—*Engineering*, 20 *January*, 1967.

### Pollution on the mind

As more and more traffic chokes city streets, put-upon pedestrians blame their stinging eyes and raw throats on the noxious outpourings from automobile tail-pipes. According to a report released last week by the U.S. Public Health Service, city dwellers may face another disorder—befuddlement by carbon monoxide (CO), which reduces the blood's capacity to carry oxygen to the brain.

The USPHS based its indictment of CO on two studies. The most recent, by the service itself, monitored CO concentrations along the arterial highways, bridges and tunnels of six U.S. cities. Researchers found the highest levels of CO in New York, and they reported that bus and taxi drivers and workers in offices within 100 feet of heavily travelled downtown Manhattan streets were regularly exposed to 30 parts of the gas for every million parts of air. This is three times higher than the levels at which mental processes become affected.

**Crossing T's:** In the other study, made by Cmdr. John H. Schulte of the Navy Bureau of Medicine and Surgery, 49 volunteers from the Cincinnati Fire Department sat at test tables with oxygen masks over their faces. Without the subject's knowledge, investigators supplied air to the masks either from the room's atmosphere or from a gas cylinder containing 100 parts of CO per million parts of air (concentrations this high have been monitored by the USPHS immediately adjacent to autos with running engines). As the level of carboxyhemoglobin—hemoglobin inactivated by CO in the bloodstream—increased in those subjects receiving air from the cylinder, so did the time required to complete *t*-crossing tests—from about 90 seconds for those breathing pure air to more than 250 for those receiving doses of CO.—*Newsweek, New York*, 23 *January*, 1967.

## NATIONAL AIR POLLUTION CENTRE

It is announced that the Public Health Service's Division of Air Pollution has been redesignated the National Centre for Air Pollution. Appointments to top-level staff positions have also been announced, all of whom were on the staff of the Division. Dr. John T. Middleton becomes Director, S. Smith Griswold is Associate Director for Abatement and Control, Dr John H. Ludwig is Associate Director for Control Technology Research and Development, Dr. Edward T. Blomquist is Associate Director for Standards and Criteria Development, and Arthur C. Stern becomes Assistant Director.

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*Israel*

## AIR POLLUTION CENTRE IN HAIFA

In Israel industrial air pollution problems are to be studied in a new laboratory which is being set up by the Haifa Technion Research and Development Foundation in conjunction with the Foundation's sanitation engineering laboratories.

It is understood that a leading local industrial company has made a grant of IL 100,000 ($33,000) to cover the cost of the air pollution study.

Know-how and assistance in training staff for the laboratory will be supplied by the Israeli Ministry of Health, which already has experience of operating air pollution laboratories.

—*European Chemical News.*

*Council of Europe*

# A CLEAN AIR CHARTER

*Forward in Europe*, bulletin of the Council of Europe, reports:

International action to fight air pollution was begun by the Council of Europe in October, 1966.

Taking part in a two-day meeting were more than 40 government experts from most of the 18 member countries of the Council as well as representatives of the Common Market, the European Coal and Steel Community, the United Nations Economic Commission for Europe, the World Health Organization, and the Organization for Economic Co-operation and Development.

The experts will begin by drafting a "Clean Air Charter" setting out principles to guide governments in framing air pollution control policies.

The Charter will deal with the three main sources of pollution: industry; domestic heating; and motor vehicles. Special attention will be given to the settling of air pollution disputes between countries.

Comparative studies of national regulations and practices will be undertaken with a view to harmonizing some points of legislation at a later stage. Such agreements will also be open to countries not belonging to the Council of Europe. The Council will make full use of technical studies to be supplied by the other international organizations which attended to October meeting.

The present moves are a follow-up to the European Conference on Air Pollution which was held by the Council of Europe in 1964.

The Council is also taking steps to combat water pollution, and a "European Water Charter" is already being prepared, which will draw attention to: the vital dependence on water of all forms of life; the limited amount of fresh water available to man; and the danger of pollution.

*Europe*

# STACK DISPERSION

## *Concawe Report*

Stichting Concawe, the Oil Companies' International Study Group for Conservation of Clean Air and Water (Western Europe) has recently issued a report, in hardback book form, on "The Calculation of Atmospheric Dispersion from a Stack".

The report is the result of a Concawe working group review appraising critically the methods of calculating stack height to satisfy a given maximum ground level concentration of pollution,

This has led to a new Concawe formula for stack height calculation, which is also expressed as a nomogram. The principal features of the formula are:

(i) a new plume rise equation derived by regression analysis of actually observed plume rises;

(ii) a dispersion calculation based on *average* meteorological parameters;

(iii) a separate correction to be applied afterwards, to account for unfavourable meteorological conditions.

This correction can then be adjusted to local circumstances.

The report is published by Stichting Concawe at 5 Gevers Deynootplein, The Hague, 12, Netherlands.

*Hong Kong*

# COMMITTEE ON AIR POLLUTION

The Government of Hong Kong has recently set up a Committee on Air Pollution, under the chairmanship of J. L. Marden, J.P. The terms of reference are to determine the causes of air pollution in the Colony, and to estimate, if possible, the extent of this air pollution and recommend: (i) what amendments or changes are required to make the existing Clean Air Ordinance effective, and (ii) what additional statutory or other controls, if any, are necessary outside the Ordinance to cover fully the problem of air pollution.

*Canada*

# "POLLUTION OF OUR ENVIRONMENT" CONFERENCE IN MONTREAL

The Canadian Council of Resources Ministers is a federal-provincial body of eleven ministers responsible for renewable resources. It sponsored a national conference in Montreal from 31 October to 4 November last, at which the problems of pollution or air, water, and soil were examined. A number of the papers discussed were preprinted, and there were group meetings in addition to general discussions. The group concerned specifically with air pollution made a number of recommendations. These included the setting up of a single federal organization, the establishment of co-ordinating and control agencies in each of the provincial governments. and stressed the need for government incentives for pollution prevention measures.

Air pollution problems calling for technical advances were specified, as the control of sulphur oxides emissions, the dispersion of gases into the atmosphere, better methods for the removal of particulate matter from emissions, and the removal of oxides of nitrogen from vehicle exhausts and large fuel-burning installations.

(We have in recent issues reported and commented upon the movement towards bringing closer together the campaigns against the various forms of pollution of, and assaults upon, the whole environment. It is interesting to see that Canada is also doing this, from the starting point of resources conservation.—Ed.)

*Sweden*

# EUROPEAN AIR POLLUTION STUDY

Stockholm, 24 Jan, 1967—A resolution to work for the establishment of a network of control stations in Western Europe for registering and analyzing air pollution was passed at a seminar of experts held at the Wenner-Gren Center in Stockholm last week. Some 30 delegates from a number of European countries attended the conference which was sponsored by the Swedish Committee for Air Purification in collaboration with O.E.C.D.

The stations would study background values for sulphur dioxide and soot, the spread of air pollution over unpopulated areas and the long-term changes taking place in the atmosphere over Europe as a result of the rapidly increasing industrialization.

A number of special stations for systematic and co-ordinated studies of the technique of collecting and analyzing air samples should also be established, the experts said. These stations should help in determining the content of other polluting substances in the air, such as lead and mercury, biocides and other organic substances.

The planned stations would largely coincide with the already existing network of small unmanned stations for chemical air control.

As a result of the scheme, Sweden would get 10 to 15 stations for measuring soot and sulphur dioxide content in the air—the most common pollution in an industrialized country—plus one special station for developing new methods and techniques.

The planned European network would be equipped and operated by the individual countries participating in the scheme, with O.E.C.D. co-ordinating the activities.

The delegates to the seminar came from Belgium, Denmark, Finland, France, Great Britain, Sweden and West Germany. The United States had sent one delegate and there were also representatives of Nordforsk, the Scandinavian research organization, and of the World Meteorological Organization.—*Swedish International Press Bureau.*

*West Germany*

## DANGEROUS EXHAUST FUMES

This is the heading given to a West German press report, dateline Munich, 24 January, which states:

The supposition that the exhausts from internal combustion engines have a carcinogenic effect was corroborated by an investigation by the Bavarian Statistical Office who published their findings today. The investigation dealt with the cases of death from cancer of the larynx bronchus and the lungs, classifying the deaths according to locality. In 1955, for every 100,000 of population in Bavaria there were on the average 17·9 cases of mortality from these causes, but in the big cities 24·9. For the year 1960 the figures were 23·4 and 30·5; and for the year 1965, 26·9 and 31·3. According to the report fumes of all kinds are found in greater concentration in big cities than in the rest of the country.

*Italy*

## REPORTS FROM MILAN

We have received four papers from the "Provincial Centre for the Study of Air Pollution" which has for approximately 10 years now been collecting statistical data relating to air pollution in the territory of the province of Milan.

Two papers deal with the carcinogenicity of Milan's Atmospheric Dust; one from the point of view of chemistry, and the other on the biological tests undertaken. Laboratory experiments were carried out to test the reactivity of aromatic polycyclic hydrocarbons in the physical state in which they are present in the atmosphere. It was proved that these hydrocarbons, when in the absorption-state on active charcoal or in the atmospheric dust itself, are not subjected to demolition by ultraviolet radiations and that they are in an inert chemical state. Experiments on animals (rabbits) have proved the essential difference between the danger of "free" aromatic polycyclic hydrocarbons and the danger of hydrocarbons in a state of absorption.

In the second paper entitled "First experiments on the potential carcinogenous effect of products of atmospheric contamination of the city of Milan", the authors, C. Mor et al. subcutaneously injected rats with an extract of the atmospheric dust of Milan, containing various hydrocarbons. They obtained the development of sarcomas in the same way as was obtained with injection of 3,4-benzopyrene. By injecting other rats with atmospheric dust containing a known absorbed quantity of 3,4-benzopyrene, they obtained fewer tumors than was the case with 3,4-benzopyrene alone.

The other two papers from the Centre, report on the results of measurements taken of areosol concentrations in the atmosphere of Milan, and on determining the granulometric composition of the atmospheric dust.

*Czechoslovakia*

## VEHICLE POLLUTION CONFERENCE

Organized by the Czechoslovak Scientific-Technical Society, a conference was held in Prague on 22 November, 1966, on the subject of air pollution problems from motor vehicles, the dangers arising and their prevention.

In the eight papers, it was pointed out that the manner in which the motorist drives considerably influences pollution. Up to 30 per cent difference in fuel consumption was found among different drivers. The slowing-down of average speed in town traffic, *e.g.* from 20 to 10 km/h caused almost a double amount of exhaust gases to be emitted. Measurements taken in a tunnel exceeded allowable limits by 5 per cent, special culprits being old and badly maintained vehicles.

The papers also dealt with the possibilities of reducing pollutants; one of these by Dr. Hunigen proposed internationally acceptable evaluation methods and limit values for diesel smoke and gaseous pollution from motor vehicles. The first part of Dr. Hunigen's paper discussed the relationship between the acceleration and the continuous engine output method, the various effects on smoke density, the behaviour and characteristics of some smoke meters, smoke density values observed on 22 engines, and the relevant regulations from 9 countries. With reference to the last, a standard was proposed by the Exhaust Measuring Station (Abgasprüfstelle) of the German Democratic Republic.

The second part of Dr. Hunigen's paper tried to show that it was misleading and incorrect to judge the pollutants emitted by internal combustion engines in terms of "volume percentages". It was also suggested that the "California cycle" was not applicable to European conditions.

## "ANTISMOG" FOR I.C. ENGINES

A device for reducing the harmful emissions from internal combustion engines has been developed in Czechoslovakia, under the name "Antismog", types I and II. Type I is for use with road vehicle engines and includes a catalysing chamber in which various kinds of catalyser can be used. However, the essence of the system is stated to be a means for recirculating a part of the exhaust gases through the cylinders, where remaining harmful constituents are burned. This is effected by control over the exhaust, which can be fully open or semi-open, the control being switched on and off by the driver as desired. The idea appears to be that the change to the semi-open cycle should be made in city streets with heavy traffic and similar circumstances. Tests claim to give a reduction of up to 98 per cent of carbon monoxide, 95 per cent of aldehydes, 50 per cent of nitrogen oxides, and similarly with other compounds.

The other device, known as Antismog II is a design with a fully closed inlet to the exhaust cycle, for use where engines are used without ventilation or are unable to take in air from the surrounding atmosphere. Here the catalyst chamber is used as a regenerator, using various metallic "superoxides", or lithium perchlorate with finely divided manganese and lithium peroxide, compressed into bricks, as the source of oxygen. The combustion products are broken down or absorbed in the regenerator, and combustion in the cylinders is maintained by the liberation of fresh oxygen. Argon or other inert gases can replace nitrogen in the gas mixture, with certain advantages. It is said that the closed system results in very silent running. Details are given of tests that are said to be highly satisfactory.

A full description will be found in *Czechoslovak Motor Review*, September 1966, which is published in an English language edition, or details may be obtained from manufacturing and marketing agency, Motokov, Pzo, Prague.

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## Atmospheric Environment

The International Journal of Air Pollution, published by the Pergamon Press, later became the Journal of Air and Water Pollution. The two subjects have now been separated again, and the first issue of the New journal *Atmospheric Environment* (Jan. 1967) has been published. For water there will be the journal *Water Research*. Atmospheric Environment is to be published bi-monthly, at subscription rates of either £14 per annum for libraries and "all other multiple-reader institutions", or £3. 10s. for individual subscribers who certify that the journal is for personal use.

The contents of the journal are usually of a highly specialized scientific character, and those of more general interest are noted in our *Air Pollution Abstracts*. In the first issue there is an important paper by B. T. Commins and R. E. Waller on "Observations from a ten-year-study of pollution at a site in the City of London".

# Green Light for Smoke Control in North West

In our Autumn, 1966 issue (No. 139, p. 32) we reported a survey of smokeless fuel needs in the North West area, published by a joint committee of the North West Black Area Local Authorities. This estimated the amounts of smokeless fuel—gas. electricity, and solid—needed to enable smoke control area extension to 1969 to be carried out.

This report has now been followed by a further report from the same committee, Availability of Smokeless Fuel (from the Town Clerk, Town Hall, Manchester, 2) which gives the information received from the various fuel and power interests on their ability to meet the increased requirements that have been forecast. The position is reassuring, and in short it gives the North West the green light to go ahead with its control plans.

We cannot do better than to quote in full the conclusions and recommendations made by the committee:

1. The assurance given to us by the manufacturers and producers of solid smokeless fuel, gas and electricity indicate that there will be adequate supplies in total to enable 460,536 dwellings in the North West Region (in addition to those subject to smoke control at 31 December, 1964) to be made subject to operative smoke control orders by 1969 in accordance with the programmes contained in the Joint Committee's survey "Smokeless Fuel Needs 1965–1969".

2. The producers of gas and electricity inform us that the present procedure, whereby each authority consults the fuel producers before making a smoke control order, would enable steps to be taken to ensure adequate local distribution arrangements.

3. Subject, therefore, to consultation by local authorities with the fuel producers prior to the making of individual smoke control orders so as to ensure adequate local distribution, the assurances received mean that local authorities in the region may proceed with the implementation of the published smoke control programmes for the years 1965 to 1969 without fear of shortages of hard coke, gas and electricity.

4. We draw the attention of black area authorities to the assurances by the North Western Gas Board . . . in that they will continue to supply gas coke for smoke control areas for which gas coke has been guaranteed so long as there is demand for the coke in the particular smoke control areas.

5. The conditions of Exchequer contribution to local authorities' expenses should continue to allow conversions to electricity, gas, solid smokeless fuel and oil to rank equally for grant since in our view it is important that householders in smoke control areas should have freedom of choice between the smokeless fuels available.

6. We see no reason why, when the capacity of the electricity permits it, grant should not, once more, be payable on the installation of direct acting electric space heaters but, in any event, the full cost of installing electric thermal storage heaters should continue to rank for grant.

7. In view of the assurances received it is not necessary for us to make any arrangements for further meetings, but we have authorized our Chairman to convene further meetings of the Committee should such meetings appear necessary.

8. We are, however, willing and anxious to consider any difficulties which any local authority may experience in relation to matters within our terms of reference and any such local authority should in the first place communicate with the Town Clerk of Manchester.

# TESTS ON EMISSION FROM REFUSE INCINERATOR STACKS

*From a Paper by A. E. Barton, F.Inst.P.C.,*
*and E. J. Ostle, A.M.I.Mech.E., M.Inst.F., A.M.I.Mr.E*

This paper, by the General Manager of the Birmingham Salvage Department, and Mr. Ostle of the National Industrial Fuel Efficiency Service, was read at the Institute of Public Cleansing session at the Public Works and Municipal Services Congress in London on 16 November last.

The paper begins by stressing the growing extent of municipal refuse incineration and the need to comply with the Clean Air Act. Reference was made to the changing nature of house refuse and the table reproduced below is of considerable interest, especially in respect of the fall in cinder content and the rise in paper content. The changes between 1964 and 1966 alone are significant.

It was decided to investigate the grit and dust, and the noxious gases, content of the emissions from a number of incinerators in Birmingham and some neighbouring areas, as well as one at a tea manufacturing company, where the material incinerated was mainly wood. N.I.F.E.S. were called in to conduct the investigation, and the paper continues by describing the sampling and measurement techniques used.

Several tables are given showing details of the test results on the seven installations investigated; on comparative emissions from these and other typical fuel-burning plant; and finally a comprehensive list of the noxious gases looked for and, when present, estimated. We can give only a summary of this table.

## Conclusions

The authors conclude by hoping that the paper will stimulate an active move towards consideration of incineration in its overall concept. They continue, verbatim, as follows:

Indications are that owing to the depletion of tipping land and the formidable growth of the packing industry an expansion can be expected in the incineration of refuse. Within the next decade many local authorities are going to be faced with expensive incineration schemes each one in the order of half to one million pounds

| *Content* | 1934 | *Percentage*<br>1964 | 1966 |
|---|---|---|---|
| Fine dust and small cinder .. .. .. | 66·68 | 37·30 | 23·59 |
| Large cinder content .. .. .. .. | 8·35 | 8·53 | 4·88 |
| Vegetable and putrescible .. .. .. | 6·09 | 8·97 | 17·47 |
| Paper .. .. .. .. .. .. | 7·71 | 31·15 | 32·92 |
| Metal .. .. .. .. .. .. | 3·31 | 4·83 | 7·12 |
| Rags, bagging and textiles .. .. .. | 1·51 | 1·12 | 2·30 |
| Glass (bottles and cullet) .. .. .. | 3·15 | 7·23 | 8·05 |
| Unclassified (not included above) .. .. | 3·20 | 0·87 | 3·67 |
| Density of refuse (cwt./cu. yd.) .. .. | 5·76 | 3·73 | 2·63 |
| Average weight of refuse per house, lb. .. | 40·1 | 43·7 | 34·1 |

**Content of House Refuse, Birmingham**

| | *Readings* *Average* | *Readings* *Maximum* |
|---|---|---|
| Nitrous gases (NO & $NO_2$) | 100 ppm | 100 ppm |
| Carbon dioxide | 6·0—7·0% | 11·5% |
| Carbon monoxide | Trace | 0·9% |
| Oxygen | 15% | 18% |
| Sulphur dioxide | 80–90 ppm | 192 ppm |
| Chlorine | Trace | 2·5 ppm |
| Hydrocyanic acid | Trace | 3·0 ppm |

Tests for hydrogen sulphide, hydrogen, methane, alcohol vapours, phosgene, arsine, mercury, and ammonia, all gave nil results.

**Summary of results of tests on constituents looked for during survey**

sterling. A total expenditure of many millions of pounds will be involved.

A large part of this work will fall upon the officer responsible for Public Cleansing and his staff. He will be required to advise his Committee upon the mechanical handling of refuse, the most suitable design of incinerator, specify the gas cleaning plant and control the associated civil engineering work. Now, such a project will occur once, perhaps twice, during the lifetime of the men responsible.

These comments are not leading up to an attack upon the autonomy of local authorities but to a suggestion that resources are pooled.

We welcome the announcement in Birmingham recently, by the Minister of Housing and Local Government, that a Working Party is shortly to be created which will consider the problem of refuse disposal in this country, and perhaps one might hope that the following items would form useful matters for probing:

i. We have seen earlier in this paper that refuse is changing and this means in effect that the fuel for the incinerator is changing. A fuel engineer will find it difficult to accept that incineration design has kept pace with developments in other spheres.

Now a manufacturer putting forward a revolutionary scheme would have great difficulty in persuading a local authority to become a guinea pig. Yet this is needed if progress is to be made. Would it not be much better that local authorities should contribute to some central fund that could cover development work?

ii. Gas cleaning plant is going to be a costly auxiliary unit in future schemes. Advice could be given upon the merits of available equipment. Furthermore development work is probably necessary with conventional designs of gas cleaning equipment to ensure optimum performance when dealing with incinerator emissions.

iii. As already mentioned the character of refuse is changing and it would seem a prudent move to anticipate the effect of these changes. A very limited investigation has already been made into chemical emissions from one chimney. It would be very reassuring to the community if these emissions were monitored. Knowledge as to the long term effects of toxic gases at low concentrations is extending and local authorities should be kept informed of the relationship to incineration.

The foregoing are suggestions which could grow into a useful programme of benefit to all local authorities. Shared between about 70 authorities who operate incineration schemes the cost would not be excessive; still less if the 450-odd authorities in the Country agreed to share the cost.

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### £2 m. spent on A.P. control

New plants at I.C.I.'s Billingham works should contribute to substantial further improvements in atmospheric pollution on Tees-side, reports *Chemical Age*. This emerged from a joint statement by Billingham U.D.C. and I.C.I., following a visit by councillors and the district Alkali Inspector to the works. More than £2 m. have been spent by the firm since the end of the war on pollution problems, including £300,000 in the last two years. Technical staff on anti-pollution work cost £30,000 a year.

# SMOKE CONTROL AREAS

## Progress Report

### POSITION TO 1 JANUARY, 1967—TOTALS

| | England and Wales | Scotland |
|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation .. | 44 | 1 |
| *Acres*, 3,400 | | |
| *Premises*, 41,060 | | |
| **Smoke Control Areas in Operation** .. .. | 2,047 | 78 |
| *Acres* .. .. .. .. .. .. .. | 488,277 | 34,796 |
| *Premises* .. .. .. .. .. .. | 2,670,977 | 203,365 |
| **Smoke Control Orders** | | |
| *Confirmed* .. .. .. .. .. .. | 196 | 18 |
| *Submitted* .. .. .. .. .. .. | 120 | 9 |
| **Grand Totals** .. .. .. .. .. | 2,407 | 106 |

*The lists below are supplementary to the information in the last issue of "Smokeless Air" (Winter 1966) which gave the position up to 1 October, 1966. They now show changes and additions to 1 January, 1967.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.*

## ENGLAND AND WALES

### NEW SMOKE CONTROL AREAS IN OPERATION

**Northern**

*Teeside*

*West Hartlepool C.B. Nos. 3 and 4.

**Yorkshire**

*West Riding (North)*

Horsforth U.D. Nos. 20 and 21. Leeds C.B. Nos. 52, 53, 54, 55 and 56. Ossett B. No. 9A. Rothwell (Yorks) U.D. No. 9. Shipley U.D. Nos. 7 and 8.

*West Riding (South)*

Darton U.D. Nos. 1 and 2.

**North Western**

*South Lancashire and North-East Cheshire*

Bolton C.B. (Victoria Road). *Chadderton U.D. No. 7. Dukinfield B. (Dewsnap). Failsworth U.D. No. 5. Oldham C.B. No. 7.

*Central Lancashire*

Colne B. No. 4. Padiham U.D. No. 7. Preston C.B. No. 15.

*Merseyside*

Birkenhead C.B. No. 4. Bootle C.B. (Netherton) No. 7. St. Helens C.B. Nos. 2, 3 and 4.

**Midlands**

*Derby, Nottingham and Chesterfield*

Chesterfield R.D. No. 5. (Eckington West). Dronfield U.D. No. 2. Sutton-in-Ashfield U.D. No. 2.

*West Midlands*

Birmingham C.B. Nos. 123, 124, 126, 127, 129 and 132.

*Potteries*

Stoke-on-Trent C.B. Nos. 7, 8, 9 and 15.

**London**

*Greater London Boroughs*

Barking L.B. No. 11. Bexley L.B. No. 6. Brent L.B. (No. 2 Kilburn). Bromley L.B. Nos. 1, 2 and 3. Ealing L.B. Nos. 24 and 25. Greenwich L.B. (Plumstead and Brook). Haringey L.B. (Tottenham No. 6). Haringey L.B. (Hornsey No. 8).

Haringey L.B. (Wood Green No. 9). Harrow L.B. No. 11. Havering L.B. No. 2. Hillingdon L.B. Nos. 1, 2 and 3. Hounslow L.B. (Brentford and Chiswick No. 7). Hounslow L.B. (Feltham No. 6). Hounslow L.B. (Heston and Isleworth No. 10). Lewisham L.B. No. 21. Merton L.B. No. 2. Richmond-upon-Thames L.B. (Barnes No. 7). Southwark L.B. No. 17. Sutton L.B. No. 15. *Wandsworth L.B. No. 7. Westminster L.B. (Harrow Road South).

*Local Authorities Outside the Black Areas*

Blackburn C.B. No. 6. Cambridge C.B. No. 2. Lancaster C.B. No. 2. Letchworth U.D. (Norton Road and Wilbury Road). Reading C.B. No. 10. Southampton C.B. Nos. 3 and 4 (Westgate).

## NEW ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*

Hebburn U.D. Nos. 5 and 6. Newcastle-upon-Tyne C.B. No. 11. South Shields C.B. No. 1. Tynemouth C.B. No. 4.

*Teeside*

*Billingham U.D. No. 4. Hartlepool B. No. 3. Middlesbrough C.B. (Lodore, Mandale and Levick).

**Yorkshire**

*West Riding (North)*

Batley B. No. 5. Bradford C.B. (Brierley). Halifax C.B. No. 13. Horbury U.D. No. 4. Horsforth U.D. Nos. 23, 24 and 25. Huddersfield C.B. (Longwood-Gledholt). Keighley B. No. 6. Leeds C.B. No. 59. Ossett B. No. 9B. Sowerby Bridge U.D. No. 4.

*West Riding (South)*

Darton U.D. Nos. 4 and 5. Doncaster C.B. No. 9. Rotherham C.B. Greasbrough No. 1. Rotherham C.B. Broom Lane No. 1. Rotherham C.B. St. Ann's Road No. 1. Rotherham C.B. Kimberworth Park No. 8. Swinton U.D. No. 12.

**North Western**

*South Lancashire and North-East Cheshire*

Denton U.D. No. 9. Droylsden U.D. No. 11. Farnworth B. (Plodder Lane South). Leigh B. No. 5. Manchester C.B. (Liverpool Road). Oldham C.B. No. 9. Stalybridge B. (Mottram Road and Mottram Old Road). Stretford B. No. 9. *Urmston U.D. No. 5. Whitefield U.D. No. 6. *Worsley U.D. No. 4.

*Central Lancashire*

Darwen B. No. 2. Nelson B. No. 2. Preston C.B. No. 16.

*Merseyside*

Bootle C.B. No. 8. Litherland U.D. No. 1. Liverpool C.B. Nos. 24 and 25. Runcorn R.D. No. 1. Wallasey C.B. No. 12. Warrington C.B. No. 10.

**Midlands**

*Derby, Nottingham and Chesterfield*

*Mansfield B. No. 4. Nottingham C.B. No. 5. Sutton-in-Ashfield U.D. No. 1. 1966.

*West Midlands*

Birmingham C.B. Nos. 128, 131, 133, 134, 135, 136, 137 and 138. Halesowen B. No. 27. Stourbridge B. Nos. 23 and 24. West Bromwich C.B. No. 16. Wolverhampton C.B. Nos. 10B, 11 and 12.

*Potteries*

Kidsgrove U.D. No. 11.

**London**

*Greater London Boroughs*

Barnet L.B. Nos. 4 and 5. Ealing L.B. No. 27. Enfield L.B. No. 14. Greenwich L.B. (Blackheath Park). Harrow L.B. No. 12. Hillingdon L.B. No. 5. Kingston-upon-Thames L.B. Nos. 9 and 10. Lambeth L.B. No. 19. Lewisham L.B. No. 22. Merton L.B. Nos. 3 and 4. Redbridge L.B. No. 13. Richmond-upon-Thames L.B. (Barnes No. 8). Richmond upon-Thames L.B. (Richmond No. 8). Waltham Forest L.B. No. 11. Westminster L.B. (Reading).

*Local Authorities outside the Black Areas*

*Gillingham B. No. 4. Heanor U.D. No. 2. Rochester B. No. 3. Rugby B. Nos. 2, 3, 4 and 5. Southampton C.B. No. 5. Warwick B. (Lodge Wood Estate). *Whitley Bay B. No. 2. Wortley R.D. (Middlewood and Wadsley).

## NEW ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Tyneside and Wearside*

Hebburn U.D. No. 7. Longbenton U.D. (No. 1 Killingworth Township). Newburn U.D. Nos. 7 and 8. Tynemouth C.B. Nos. 3, 5 and 6.

*Teeside*

Thornaby-on-Tees B. No. 3. West Hartlepool C.B. No. 6.

**Yorkshire**

*West Riding (North)*

Batley B. No. 6. Heckmondwike U.D. No. 6. Leeds C.B. No. 61. Mirfield U.D. No. 8. Normaton U.D. No. 1. Ossett B. Nos. 10 and 11. Pudsey B. Farsley (South) No. 5. Stanley (Yorks) U.D. No. 1. Wakefield C.B. (Flanshaw No. 1).

*West Riding (South)*
Darton U.D. Nos. 6, 7, 8 and 9. Wath-upon-Dearne U.D. No. 3.

**North Western**

*South Lancashire and North-East Cheshire*
Altrincham B. No. 6. Atherton U.D. No. 3. Bolton C.B. (Haliwell & Smithills). Bury C.B. No. 6. Chadderton U.D. No. 8. Failsworth U.D. No. 6. Heywood B. No. 7. Middleton B. (Langley No. 10B). Radcliffe B. No. 4. Stretford B. No. 10.

*Central Lancashire*
Accrington B. Nos. 1, 2, 3, 4 and 5. Burnley C.B. No. 9. Fulwood B. No. 1. Preston C.B. No. 17.

**Midlands**

*Derby, Nottingham and Chesterfield*
Beeston and Stapleford U.D. No. 8. Chesterfield R.D. No. 9. Derby C.B. No. 9. Derby C.B. No. 10 (Alvaston). Dronfield U.D. No. 3. Ilkeston B. No. 2. Nottingham C.B. No. 8A. Staveley U.D. No. 1. Sutton-in-Ashfield U.D. Nos. 2 and 3. 1966.

*North Midlands*
Leicester C.B. Nos. 17 and 18.

*West Midlands*
Aldridge-Brownhills U.D. Nos. 24 and 25. Coventry B. Nos. 9, 10, 11, 12, 13

## SUMMARY OF SMOKE CONTROL PROGRESS

### As at 31st December 1966

| (1) *Region* | (2) *No. of acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage* of total black area acreage in the region so covered* | (4) *No. of premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage* of total black area premises in the region so covered* |
|---|---|---|---|---|
| Northern .. | 21,705 | 17·32 | 99,795 | 18·04 |
| Yorkshire and Humberside .. | 112,540 | 29·9 | 381,600 | 32·67 |
| East Midlands .. | 34,780 | 12·96 | 117,485 | 22·95 |
| Greater London[1].. | 173,240 | 52·97 | 1,537,980 | 58·03 |
| North Western[2] .. | 115,725 | 28·8 | 537,370 | 31·55 |
| West Midlands[3] .. | 54,655 | 21·9 | 233,825 | 22·23 |
| South Western .. | 5,050 | 19·17 | 18,105 | 12·15 |
| Wales and Monmouthshire .. | 45 | 0.01 | 650 | 0·15 |
| Totals (black areas) | 517,740 | 24·13 | 2,926,810 | 35·66 |
| Outside black areas (all parts) .. | 90,655 | | 316,018 | |
| Grand Totals .. | 608,395 | | 3,242,828 | |

*The percentage shown in columns (3) and (5) above are percentages of the total acreage and of the total number of premises in the black areas concerned. In practice it may not always be necessary for the whole of a black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country).

| | |
|---|---|
| [1] Barking No. 12 Order (154 acres 1935 premises) | withdrawn |
| [2] Great Harwood No. 1 Order (800 acres 642 premises) | withdrawn |
| Bebington No. 18 Order (24 acres 140 premises) | withdrawn |
| [3] Dudley Nos. 27 and 28 Orders (totalling 128 acres and 966 premises) | Orders invalid |

*Note*

*Non-black authority*

| | |
|---|---|
| Leamington Spa Nos. 9 and 10 orders (totalling 263 acres 590 premises) | withdrawn |

and 14. Dudley C.B. Nos. 47 and 48. Stourbridge B. No. 25.

*Potteries*

Kidsgrove U.D. Nos. 12 and 13. Stoke-on-Trent C.B. No. 16.

**London**

*Greater London Boroughs*

Brent L.B. No. 3 (Kingsbury). Camden L.B. (Hampstead No. 9 and Hampstead No. 10). Camden L.B. (St. Pancras No. 8). Ealing L.B. Nos. 28 and 29. Hackney L.B. No. 11. Harrow L.B. No. 13. Havering L.B. No. 3. Islington L.B. Nos. 24 and 25. Lewisham L.B. No. 23. Merton L.B. No. 5. Newham L.B. No. 4. Richmond-upon-Thames L.B. (Twickenham No. 6). Sutton L.B. No. 16.

*Local Authorities outside the Black Areas*

High Wycombe B. No. 14. Lancaster C.B. No. 4. Luton C.B. No. 5. Potters Bar U.D. No. 2. Skelmersdale U.D. No. 2. Slough B. No. 11. Staines U.D. No. 8. Waltham Holy Cross U.D. No. 1. Watford B. Harwoods (No. 6). Watford B. No. 7. Whiston R.D. (Knowsley No. 1).

## SCOTLAND

### NEW SMOKE CONTROL AREAS IN OPERATION

Clydebank No. 5 (Boguhenran *Glasgow (Dennistoun) Paisley (Thornby Park/Lochfield) Renfrew Burgh No. 2.

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

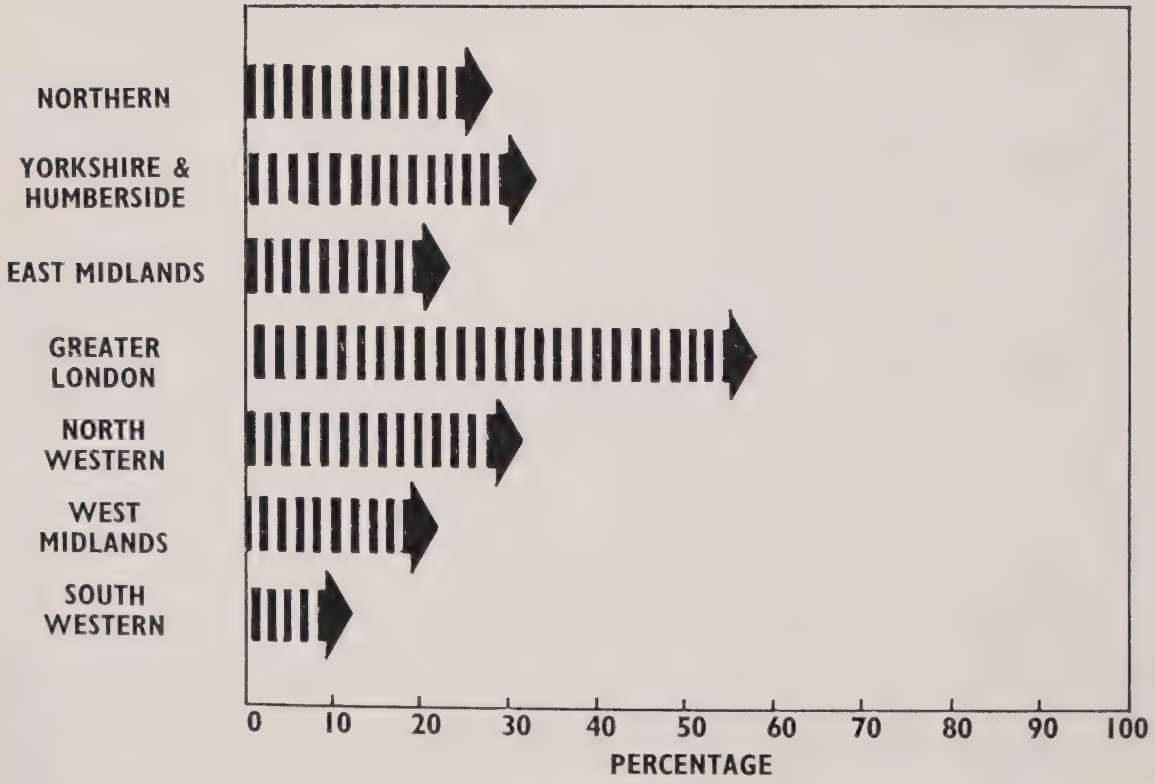
East Kilbride (Eastmains, Calderwood and Southern Extension). Lanark County (Burnside (Remainder) and Cambuslang). Rutherglen (Stonelaw). Stirling County (Bannockburn No. 2).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Dumbarton Burgh Nos. 6, 7 and 8. Falkirk No. 5. Renfrew Burgh No. 3.

## REGIONAL PROGRESS WITH SMOKE CONTROL

The diagram shows the percentage of premises covered by smoke control orders in each of the English "Black Areas" at the end of 1966.



# *Air Pollution and our Technology*

**A Paper from the U.S.A. National Conference by Eric A. Walker, President, Pennsylvania State University.**

A SOCIAL historian of the future, faced with the task of trying to single out the most significant intellectual development of the second half of the twentieth century, might well decide that our most important contribution to the general growth of human progress was our growing awareness of the interdependence of all human knowledge. I doubt if there is any more significant development of our times than our relatively recent realization that the future of our complex civilization depends not so much upon independent advances in the diverse fields of human activity as it does upon our ability to integrate our knowldge and apply it in a systematic and coordinated fashion to the problems of modern life.

Throughout history, man has sought to increase his knowledge of the natural forces at work in his environment and to use this knowledge to satisfy his desire for a fuller and richer life. The scientific discoveries and technological developments of the past have gradually freed the individual from the need for personally seeking the means of meeting his basic requirements for food and clothing and shelter. For centuries, the trend has been toward a division of labour, toward continually increasing specialization, toward a departmentalization of the knowledge that has been accumulated. In the traditional disciplines and subdivisions of human activity, we have tended to work independently, with little thought of the effects on other areas of human endeavour. Even within separate disciplines, there has been a trend toward separation and isolation, as knowledge and technology have grown. Civil engineers, for example, who for centuries took care of our technological needs, have over the years found it necessary to branch out into specialized fields like electrical engineering and mining engineering, and sanitary engineering, and even aerospace and nuclear engineering. In medicine, the general practitioner has given way to a variety of specialists, and the process has been carried out almost indefinitely.

The story is told of the young man who was discussing his plans to study medicine with his old family doctor. "I suppose you're going to specialize," said the doctor. "Well, the ear-nose-and-throat field needs good men." "Oh, that's much too broad a field," the youngster replied, "I'm planning to specialize in diseases of the ear." "Really?" asked the old doctor, "Which ear, the right or the left?"

Yet in almost every field of human endeavour, this process of increasing specialization has been a practical necessity in our efforts to keep pace with the accelerating growth of knowledge. Without it we could not have developed the technological competence which characterizes our civilization. But it has also had disadvantages. It has produced artificial barriers in our common efforts toward a better life. The physical scientist speaks a different language from the social scientist, and both find it hard to understand the goals and objectives of the humanist or the politicain. Indeed, a few years ago, the British scientist, Sir Charles Snow was very much concerned about this matter. He believed that a serious gulf had developed between our scientists on the one hand and our humanists and political leaders on the other, and he warned that this inability to communicate might prove disastrous to both groups. He even deplored the gap which he believed was growing up between the research scientist and the engineer.

Yet I think Sir Charles failed to take into account a very important trend which has been making itself felt for the past decade or so—a trend which, as I said a moment ago, may well turn out to be our most significant contribution to man's intellectual development. I think we have begun to learn the real advantages of crossing the formerly rigid lines of the separate disciplines and to approach our problems in the light of their implications and effects on the total social structure. Certainly it is evident that the physical scientist, the social scientist, and even the administrator have learned the advantages of using the special skills and expertise of the statistician and the programmer of computers. The archeologist has learned that the physicist and chemist can use their special knowledge to help him unlock the secrets of dating long-buried artefacts and human remains. Indeed, whole new areas have sprung up which straddle traditional disciplines, like biophysics and biochemistry and medical engineering. One of the current problems of most university administrators is that of providing for management of interdisciplinary research and teaching programmes that cross the traditional lines of university organization.

Terms like human development, regional analysis, water resources, space science, urban redevelopment, community relations, and many others reflect this growing trend. More and more we find ourselves called upon to draw upon the resources of a wide variety of traditional specialities in order to solve the large-scale problems of modern life. The birth and rapid development of the whole science of operations research or systems analysis is an indication of how conscious we have become of this need for combined and integrated effort in facing the needs of the future.

Yet, in spite of our efforts and accomplishments along these lines, we have not yet been very successful in applying this method to the very large-scale socio-technological problems of our times. Problems like high-speed mass transportation, water retrieval, disposal of sewage and of solid wastes, and similar problems, involving not only technical expertise but also a wide range of social, political, and economic considerations—such problems demand the kind of approach that we we only beginning to apply with any real competence. And perhaps of all the problems that fall into this category, none is more complex, more widespread, and of more importance in terms of our future well-being than that of air pollution.

The simple fact is that the control of air pollution, at the present point in time, is not basically a technical problem—at least in the traditional sense. I do not mean to imply that we have mastered the technology involved or that we have found all the technical answers we need even to free our atmosphere from the grossest types of contamination. Far from it. Yet, in terms of our understanding of the basic causes of the difficulty and of the technical measures that can be effective in overcoming it, I think it is fair to say that the technology of air pollution control—the state of the art—is in a fairly respectable position.

We know, in a practical sense, and with a reasonable degree of certainty, where the most noxious of the common air pollutants come from. We have at least a gross understanding of the dangers to life and property that can result from serious pollution. We have a basic knowledge of the meteorological aspects of the problem. And we have the evidence of cities like Los Angeles and Pittsburgh to indicate that the application of properly designed control measures can bring a reasonable degree of local abatement. In short, from the point of view of technology, we have enough knowledge about the causes and consequences of the problem to understand what can be done, where more research is needed, and what kind of knowledge can be helpful in the design of devices and equipment to do the job.

### A Dynamic Situation

I do not mean to imply, of course, that there should be any slowing down of our research and development efforts on the technical aspects of the problem. On the contrary, I think that the knowledge we already have is itself an obvious spur to a more vigorous attack. We realize that we are dealing with a dynamic situation, a situation that will continue to demand increased effort on all fronts.

We know that continued and expanded research is needed simply to keep up with the increasing pollution load we must be prepared to expect from normal growth. We can assume that with the increase in population, there will be an accompanying increase in industrial and commercial activity, in transportation, and in urban concentration and expansion. Moreover, with the demand for continually higher standards of living, we know that there is likely to be even greater growth, proportionately, in these areas, and that better technical means of solving the resulting pollution problems must be developed. Some idea of the magnitude of the problem we are likely to face in this respect is found in the recent report of an advisory panel on the adequacy of technology for pollution abatement for the House Committee on Science and Astronautics. The panel pointed out that the noxious emissions from motor vehicles, even if all of them were equipped with present-known devices for suppression, would rise, by the end of the century, to a level equal to the 1965 rate, when no suppression was employed.

Beyond this, we will need continuing research to take care of the changes we must expect in industrial development, as the result of newly developed processes, the changing availability of various kinds of fuel, and so on. If we can reasonably look forward to the gradual elimination of the pollution problem in some areas, we must also expect the problem to grow in others, or completely new problems to develop.

Certainly one of the areas in which research can be beneficial is that involving cost. We need cheaper equipment and cheaper methods of control. Even if we assume that our present technology can produce devices that are economically feasible, cheaper methods will always be desirable and may indeed be essential for continued economic growth.

We need more knowledge, too, about the long-range effects of pollution, not only on human health, but on vegetation, domestic and wild animals, and materials. We lack information, for example, on the physiological response of man to long-term low-level exposures, and we have much to learn about the effect of pollutants on the ecological balance in non-urban areas.

And there is still much work to be done on the basic job of defining the extent of the pollution we face. Although we have a great deal of experience in what might be called our piecemeal approach to the problem, we are still unable to agree on meaningful criteria and standards that can be universally applied. We need to "define" our air environment, not only in terms of the sources, types, and concentration of the pollutants that are emitted into it but also in terms of the underlying features of their transport. We need much more information on the effects of atmospheric dispersion, and on the reactions and interactions of pollutants during the dispersion period. And for this we must have better equipment for sampling, for measuring, and for analysis, not only at ground level, but also through the use of portable towers and air-borne devices. We need to develop methods for instantaneous detection and sampling, and to work out techniques for operations over large areas.

### The Basic Problem

Clearly, continued and expanded research on the technological aspects of air pollution will be needed for a long time to come. Yet, having said all this, I want to repeat the statement that I made a moment ago—that the basic problem in air pollution control is not a technological one. Not only do we have a good many years of practical experience to draw on, but I think there is every reason to expect that our scientists and engineers will more than keep pace with non-technical developments in the field. In a number of universities throughout the country, my own included, the problem is recognized, the objectives are understood, and research programs are under way. And even if "participation by private industry," as the Wolman Report points out, "is very limited," it seems to me that the real difficulty here is a matter of incentive or a matter of cost rather than lack of technical competence.

And I think there is evidence that the seriousness of some aspects of the problem, at least, are being more generally recognized. Recent reports from the Ford Motor Company and General Motors about their research on the development of light-weight batteries to power electric automobiles is an indication, if nothing else, of their recognition of a growing pressure on the part of our law-makers and the general public for a broader and more stringent attack on the whole problem.

The real difficulty, it seems to me, is not that our technology is seriously deficient, or that it is unlikely to keep pace with the growing problem, but that our efforts to control air pollution have, up to now, been very largely piecemeal efforts. In spite of our long-standing concern with the various aspects of the problem, we have for the most part attacked it in terms of a single industry, or a single source of pollution such as domestic incinerators or the fumes from automobiles and trucks. And even where we have attacked the problem on a community-wide basis, we have allowed ourselves to be hampered by legal and political complications, and the extent of our efforts has been curtailed by municipal, or county, or township boundaries. The unfortunate consequences of this sort of approach are well illustrated in a distressingly ironic comment which appeared recently in the New York Times. The article is brief but its implications are tremendous. Let me quote it in full.

> "Cincinnati, 25 October—Cincinnatti celebrated the opening of "Clean Air Week" Monday with a day and night of smog, the worst in its history. A choking, acrid vapour swept into the city from adjoining counties."

It seems to me that the problem we really face is a problem of integrating our attack, of coordinating our efforts, of pulling together the knowledge we have gained, and are gaining, of the factors involved—in all their diversity and complexity—and then applying to the whole situation the kind of broad interdisciplinary approach that has characterized the development of our best technological efforts in the past few decades. This will not be an easy job. I doubt if any of the large-scale problems we faced in recent times—including that of putting astronauts into space—has presented us with so great a challenge.

Air pollution control demands our highest levels of scientific and engineering skill in a wide range of technical areas. But beyond this it involves an even wider range of political, legal, and economic considerations which impinge upon long-standing customs and practices and which are entangled with the most deep-seated forces in our social structure.

### A New Concept Needed

We need, somehow, to achieve a fundamental change of attitude—a whole new point of view toward the situation. We must realize that clean air, and for that matter clean water and all the other benefits of the natural world, belong to everyone, and that nobody has the right to destroy them. And we must find practical ways of regulating our conduct so that this new concept becomes a basic force in every aspect of our economic and social development. This will involve a radical shift in our ways of doing things.

Under our present system, the man who neglects this responsibility, or who refuses to accept it, is actually rewarded—in the sense that he can make his product or provide his service without the added cost of anti-pollution measures. And his competitor, the enlightened, public-spirited manufacturer or industrialist, is penalized accordingly. As long as our attack on the problem is piecemeal, as long as our legislation is concerned with local conditions, this situation will exist.

What we need is a judicious system for rewarding those who use technology to produce the best possible product or service at the least possible cost—but who do it without destroying the natural benefits which rightfully belong to all of us—the air, the water, and the open spaces that constitute our mutual environment. The approach we make must be industry-wide and nation-wide, and comprehensive in nature. There is little to be gained if we succeed in eliminating the dust from a cement plant only to have it replaced by the oil fumes from a bituminous concrete plant. However we accomplish the end—through tax benefits or some other method—we can do it only through a coordinated, integrated method of rewarding the conformist and penalizing the irresponsible.

As a beginning, there are, I think, three aspects of the problem that demand immediate attention. First we must exert every possible effort to develop better channels of communication among all those who have some part to play in a coordinated attack on the problem. In the sphere of technology, this means better and quicker transfer of knowledge between the physical scientist and the engineer who must make practical application of newly discovered information. It means more adequate understanding among the biologists and physicians and chemists and meteorologists and agriculturalists involved. But more than this, the problem demands a new kind of communication between all these people on one hand and our political, legislative, and administrative leaders on the other—a kind of communication which, on this scale at least, has never existed before.

Secondly, I think we must undertake an intensive programme of public education. Certainly without public awareness of the life-an-death nature of the problem, any attack we attempt will be severely hampered if not impossible of accomplishment. And if, in the process, we encounter continued apathy or evasion on the part of those whose whole-hearted cooperation is needed, then it seems to me we must resort to legislative measures to gain compliance. In either case, we must rely not on prejudice and personal judgment but upon criteria and standards based on the accurate measurements and rational understanding that our technology can now—or will soon be able to—provide.

And finally—and most important—we must extend and develop our techniques for systems management so that they can be effectively applied to a problem of this complexity. We must make use of every available development in this area. And here again let me say that the extent to which social and legal and political inputs to the problem are involved presents an unparalleled challenge.

On all three of these counts, it seems to me that the present conference is a start in the right direction. A gathering of this type should provide, if nothing else, an awareness of the complexity of the problem we face, an understanding of its vast and serious implications, and an incentive toward the kind of co-operative effort without which it cannot be solved.

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According to a U.S. Representative a queen bee's life expectancy is cut in half in areas of chronic smog.

# *The State of our Atmosphere*

**A Paper from the U.S.A. National Conference, by James P. Dixon, President, Antioch College, Yellow Springs, Ohio**

WE come to this conference with a sense of crisis about an absurd situation. The sense of crisis is revealed by the increasing efforts to define, discuss, speculate, and prophesy about air pollution. Such discussion goes on among scientists, among politicians, and in the public press, radio, and television. It is heightened by statements of the President and his cabinet officers. It is heightened because it comes at a time when mankind is facing the truth that the good life at least as defined in Western industrial terms is not obtained without marked modification of the physical and social environments. Orange groves are bulldozed to make cities. Fish die in streams polluted with pesticides. The derelict remains of automobiles clutter our landscape. And the air is being loaded almost promiscuously with the waste products of this industrial age.

Our situation is absurd because it is not rational. For the choices of the alternate uses of energy and resources which are part of our technological system are not, as far as their human outcomes go, based firmly upon science, certainly not the science of the Eastern dervish who, according to an ancient Arabian tale, admonished his sultan: "Do not begin an act whose end you cannot foresee." The sultan bound by this advice, saved himself from dying from a poison on a lancet in the hand of his plotting grand vizier.

And not being able to foresee outcomes the technological system does not detect the points at which the pollution of the air is packed beyond the limits of safety, comfort, and beauty.

Our wastes are increasing exponentially along with the growth of wealth and population. Science tells us that in the light of our present knowledge prediction of the capacity of the atmosphere to accommodate wastes is an indeterminate problem. Common sense tells us that there are already circumstances under which the capacity is being exceeded.

The earth's atmosphere is a gaseous envelope. Its principal constituents are nitrogen and oxygen which account for 21 per cent and 78 per cent respectively of the volume of the air. Water vapour content is variable—at 100 per cent relative humidity about ·01 per cent by volume at —40° to about 7 per cent at 100°F. Carbon dioxide constitutes about ·03 per cent by volume. Like oxygen it is being continuously withdrawn and added to the atmosphere. But its small relative volume is maintained by virtue of the fact that there is absorbed in the ocean waters about 1,000 times as much carbon dioxide as occurs in the atmosphere.

Approximately half of all the air lies within 3½ miles of the earth's surface. Nearly all of the air including almost all cloud formation is contained within the trophosphere—that layer of the atmosphere which extends to an altitude of about 10 miles in the tropics and 6 miles in the temperate zones.

It was in the primeval purity of this trophospheric environment that man's initial evolution took place. Until he discovered fire the available pure air was for practical purposes unlimited. With the discovery of fire he started the process of air pollution as we now know it—a process which was to accelerate continuously as he learned with increasing efficiency how to release stored energy to modify his local environment.

All life is characterized by a process of conversion of energy from one form into another. Man can be distinquished from the animal level by the extent that he deliberately converts this energy by processes outside the limitation of his own body. All energy conversion is accompanied by certain material byproducts. It is the discharge of these byproducts into the air at an ever-increasing rate during the past century which results in the phenomenon of air pollution.

What are these pollutants that result from the conversion of energy under human direction? They can be defined as chemical, biological, economic—chemically by their composition, biologically by their interaction on living systems, both human and other, economically by their social charactersitics.

The principal pollutants (ignoring water) appear to be inorganic and organic gases and particulate matter. Carbon dioxide and monoxide; sulphur dioxide and hydrogen sulphide; nitric oxide and dioxide are the main inorganic gases produced from combustion of fossil flues. Also in the category of inorganic gases hydrogen fluoride must be mentioned both as an industrial byproduct and as rocket fuel.

Among the organic gases is ethylene which, although it arises from industrial sources, has as its primary source automotive exhaust. Of equal importance are the higher numbers of the olefin series which, taken together in the presence of sunlight with other classes of organics, nitrogen dioxide, or nitric oxide, result in a complex chemical reaction which has come to be known as the "Los Angeles smog reaction".

### Ubiquitous Indicator

The most common particulate matter in cities is that ubiquitous indicator of human existence—dirt. Next most prevalent is soot—finely divided carbon resulting from inefficient combustion of carbonaceous fuels. Soot carries with it, because of its enormous surface per unit of weight, a load of heavy hydrocarbons of the sort found in smoky flames.

Three other classes of particulate matter deserve mention. The economic poisons, radioactive material, and pollens. The economic poisons, while primarily non-urban in their use, are often disseminated through the air, finding their way beyond the intended site of application. Airborne radioactive contamination arises from the use of such material in research and in power production, and of course from the testing and use of nuclear weapons, and in global biological terms is undoubtedly the pollutant of greatest potential hazard.

It has been estimated that these various pollutants are being released into the air over the United States at a total rate of over 130 million tons annually—or more than half a ton per person per year. Somewhat less than 1 per cent of this total is accounted for by pollen; somewhat over 10 per cent by industrial dirt and ash, including soot; about 20 per cent by natural dust; another 20 per cent by sulphur oxides; and the remainder by all other pollutants.

The sources of the five major pollutants—carbon monoxide, sulphur dioxide, hydrocarbons, oxides of nitrogen, and particulate matter—are estimated in terms of annual production as follows. In first place come automobiles, trucks, and buses, accounting for 85 million tons a year Second are manufacturing industries accounting for 22 million tons annually. In third place are the 15 million tons produced annually by electric power generating plants, and finally the heating of homes and other buildings produces 8 million tons.

Described in chemical terms the major air pollutants arise because of the combustion of fossil fuels. The burning of hydrocarbon fuels in internal combustion engines is the single most important pollutant source. Small wonder, then, that there is revived interest in the electric-powered automobile.

The biological effects of air pollution range from explicit to speculative. A case in point is the difference between the behaviour of the oxides of carbon. The toxic effects of carbon monoxide have been known since antiquity. Carbon monoxide begins to be hazardous to humans at a concentration of about 100 parts per million if the level is maintained for several hours. This level can be reached in areas where the traffic is heavy. The global increase in concentration of carbon dioxide appears on the other hand to have had no direct effect upon living organisms. It is of speculative interest because the ability of the atmosphere to retain heat is increased by increased concentrations of carbon dioxide. Small temperature changes—on the order of a degree—profoundly affect the earth's climate. Hence this gradual heating up as a result of the increased carbon dioxide from the use of fossil fuels could be an important factor in modifying the ecology of the planet.

Sulphur dioxide, when in the presence of air and water, is an intensely irritating substance at a level of a few parts per million. It is generally believed that sulphur dioxide can be a dangerous pollutant. As evidence is the fact that it has been centrally involved in all of the air pollution disasters of recent history. Hydrogen sulphide, on the other hand, seems rarely to reach hazardous concentration in the open atmosphere.

The oxides of nitrogen together with hydrocarbons figure in the complex smog reaction which produces an end-product mixture that, in addition to damaging plants in specific ways, also causes irritation to the eyes and mucous membranes of humans and introduces an environmental hazard by reducing visibility.

Hydrogen fluoride is extremely toxic to nearly all plants and animals. It creates local problems of pollution when it is produced in the manufacture of phosphate fertilizers, certain iron ores, and the manufacture of aluminium. It has a potential for much wider distribution, however, than its use in rocket fuels.

Air pollution tends to be an urban phenomenon. Here the concentration of products from power plants, industry, and automobiles is high. And the fall of dirt and soot may exceed a pound per square foot a year. There has been, then, a particular interest in the health effects of exposure to urban air pollution. So far evidence is lacking that long continued exposure to low levels of air pollution is having unfavourable effects upon human health. This is the finding of the Environmental Pollution Panel of the President's Science Advisory Committee. They go on to state that

> Ill effects if present must be markedly less noticeable than those associated with cigarette smoking. Attempts to identify possible effects of ordinary urban air pollution on longevity or on the incidence of serious disease have been inconclusive. Special attention has been focussed on lung cancer which is known to be closely associated with tobacco smoking and with the inhalation of radon, radioactive materials, nickel carbonyl, chromates, asbestos, and other chemicals. There are consistent findings of a greater incidence of lung cancer in cities than in the country and it is possible that urban air pollution is a contributory factor to the disease.

One important caution is raised by biologists about this kind of negative finding. They point out that all living things are interdependent and interacting, merged into a single dynamic system. Tampering with the system produces many side-effects, some of which can be damaging. Thus the temptation to caution, even when the data concerning specific effects on humans, plants, and animals are not in themselves and in the short run alarming.

Persons who take this view are apt to see in the world-wide data strong evidence that air pollution is associated with a number of respiratory ailments, notably nonspecific respiratory ailments, chronic bronchitis, chronic constrictive ventilating disease, pulmonary emphysema, and bronchial asthma, as well as lung cancer.

### Economic Terms

Only recently have serious efforts

been made to define air pollution in economic terms. Early activities were confined for the most part to efforts to determine the external costs of agricultural losses and property values. These are not insignificant. They were considered to amount to $65·00 per person a few years ago. But more recently as the problem of pollution has been seen more and more to be a problem of air conservation, there has been an increased interest in the application of economic analysis to public policy concern with air pollution.

In economic terms air pollution is an external cost generated by production and consumption processes. The goal of economic analysis is to find means so that decision on how much to produce and what technologies to employ take proper account of all the costs and benefits arising from the economic activity being examined.

The economic management of air pollution appears to be somewhat analogous to the water pollution problem. This gives rise to the notion of the air shed as analogous to the water shed. For several reasons it is thought that the air pollution is more difficult to deal with than the water pollution problem. First, the evidence linking air pollution to health is somewhat stronger than that so linking water pollution. Second, air pollution is more local than water pollution and hence requires a heavier burden of control. Third, the meteorological events associated with air pollution are more difficult to control than the hydrological events associated with water pollution, for while the atmosphere has powerful self-cleansing properties, these are not presently subject to human control. Finally, air pollution can best be controlled at its source, while there are alternative ways of dealing with water pollution at a distance.

Thus in economic terms, despite considerable effort and interest, we are as yet not able to measure the costs of air pollution damage. Cost benefit analysis is very difficult here. Nor would economists agree on economic solutions for control. Perhaps they cannot be expected to do so because the criteria which must be taken into account in air pollution control are social, biological, and psychological, as well as economic.

These, then, are the dimensions of the air pollution problem, dimensions which define the problem in terms that suggest to many that the air is a finite resource in the public domain. It is a problem derived from the use of fossil and radioactive fuels. Once coal-burning furnaces were the great producers of primary pollutants. Now the internal combustion engine is the great producer of both primary and secondary pollutants. In the future the greatest hazard may be from nuclear materials.

Air pollution endangers crops, livestock, and humans. Once emitted into the atmosphere it is almost impossible to control. For its coverage, concentration, and dispersion are subject to meteorological forces not under human control. But neither, under present present policy, can it be adequately controlled at its source.

In this situation of Absurd Crisis we do not of course draw away from rational solutions. We are as human beings conditioned to be optimistic about our ability to use the peculiarly human asset of conceptual thinking. This is an old optimism.

It is said, for instance, that a Chinese character which may be read as meaning "crisis" can also be translated to read "opportunity". We will, I suppose, acknowledge the rational as an antidote to the absurd just as did Camus in the *Myth of Sysiphus*. But even when knowledge and concept fail to produce solutions we always have the possibility of using political methods to express a priority of values to guide human evolution.

In that sense this conference, which is part of a political process, is crucial. For political process is one mode of achieving moral and ethical judgments. The problem of air conservation, as

(*Concluded, page 175*)

# QUESTIONS IN PARLIAMENT

### Motor Vehicle Exhaust Fumes

**Mr. Longden** asked the Home Secretary how many prosecutions for excessive exhaust fumes from motor vehicles have been brought in each of the last five years. Mr. Roy Jenkins (written answer): The number of prosecutions in England and Wales under the Motor Vehicles (Construction and Use) Regulations for the unlawful emission of smoke, etc., was as follows:

| | |
|---|---|
| 1961 .. .. .. | 1,672 |
| 1962 .. .. .. | 2,777 |
| 1963 .. .. .. | 2,867 |
| 1964 .. .. .. | 3,261 |
| 1965 .. .. .. | 2,800 |

(*10 November.*)

### Concessionary Coal (Smokeless Fuels)

**Mr. Marquand** asked the Minister of Power whether he is aware that the present arrangements whereby coal miners who live in areas designated as smokeless zones have to surrender their concessionary coal at pit head price while having to pay the retail price for smokeless fuel means that such miners suffer a financial loss; and whether he will give a general direction, in the public interest, to the National Coal Board to discontinue this practice.

**Dr. Bray:** No. Arrangements about concessionary coal and its replacement by smokeless fuels are agreed between the National Coal Board and the Unions. I have asked the Chairman of the National Coal Board to write to my hon. Friend to explain these.—(*20 December.*)

### Exhaust Fumes (United States and European Requirements)

**Mr. John Hall** asked the Minister of Transport what progress has been made by motor manufacturers in solving the problem of limiting the emission of noxious exhaust substances to meet United States and European requirements.

**Mrs. Castle:** I understand that while there are still difficulties to resolve, British motor manufacturers generally expect to be able to meet the United States requirements on the versions of 1968 model cars produced for export to the United States.

European requirements, though now under discussion, have not been laid down. (*25 January.*)

### Smoke Control

**Mr. Longden** asked the Minister of Housing and Local Government what action he has most recently taken to encourage local authorities in the black areas to bring their areas under smoke control.

**Mr. Mellish:** The Department wrote last year to a number of authorities which had made little progress. Of these, 22 have submitted smoke control Orders since, and a further seven have been amalgamated with authorities carrying out smoke control programmes. The Department has pursued the matter with the others, and some are expected to submit Orders shortly.

More premises were included in smoke control Orders last year then in either of the two previous years.

**Mr. Longden:** Whilst thanking the Minister for that reply may I ask whether he is satisfied that the Clean Air Act is having any effect whatsoever in making the air in London less filthy?

**Mr. Mellish:** London has a very good record in this matter. Last year we published a list of those authorities which were not complying with the request. In fact, we showed up those authorities for being black. It had a remarkable effect. (*7 February.*)

### Smokeless Fuels

**Mr. Iremonger** asked the Minister of Power if he will make a statement about the availibility and prices as compared with ordinary fuel fo smokeless fuel for people living in newly declared smokeless zones in Redbridge; and what plans he has for special price concessions for retirement pensioners whose fuel bills are increased by the requirement to burn smokeless fuel.

**Mr. Freeson:** Supplies and prices of smokeless fuels in particular areas are matters for the suppliers and distributors. The Supplementary Benefits Commission will consider making a special grant to help pensioners eligible for supplementary benefits who find themselves in difficulty as a result of having to switch to smokeless fuels.

**Mr. Iremonger:** But surely the Minister realises that this is not a matter of people on National Assistance, as they still regard themselves, but of people on very marginal incomes just above that level. As the hon. Gentleman's Government have already arranged for old-age pensioners to have indiscriminate benefits on public transport, will they not now do something about people who want to keep themselves warm in the winter?

**Mr. Freeson:** I do not think that I can add very much to what I have already said. Questions about the level of pensions and the incomes of people in difficulties are for the Minister of Social Security. As I have indicated, if certain people are in difficulties they can make application and receive assistance.

**Mr. Molloy:** Is my hon. Friend aware that there is a great deal of bitterness extant amongst members of the general public over what they consider to be cheating amongst retailers over price increases for smokeless fuel? If my hon. Friend is to say that that is the public's responsibility it seems pointless for them to complain in order to be protected against this cheating, as they have been asked to do by the First Secretary. Will not my hon. Friend reconsider his reply, and say that on receipt of complaints of these increases his Ministry will thoroughly examine them?

**Mr. Freeson:** I am sorry if my previous replies implied, or were taken to imply, that we would not investigate complaints reported to us. In fact, the Department is dealing with complaints very thoroughly. We have had quite a number, and I can assure him that we shall continue to investigate them. (*17 January*.)

### Motor Vehicles (Fumes)

**Mr. Mapp** asked the Minister of Transport if she will now make a statement on the proposed regulations covering motor vehicles fumes.

**Mrs. Castle:** I will make new regulations controlling fumes from petrol-engined motor vehicles if and when research now proceeding in this country and under the aegis of the Economic Commission for Europe shows this to be necessary and practicable.

The plating and testing of goods vehicles as provided for in the Road Safety Bill and the introduction of a British Standard for diesel engines will result in less diesel exhaust smoke. (*8 February*, *1967*)

### The State of our Atmosphere
*—concluded*

put by the A.A.A.S. Commission on Air Conservation,

> is to select the appropriate means for either disposing of or using the by-products and to employ appropriate forms of energy, The definition of such an optimum, the risks we are prepared to take for the benefits we enjoy is not a matter of scientific judgment but rather one of moral and ethical judgment . . . Mankind must ultimately make such a decision. We cannot abandon our technology without relapsing into savagery. But we cannot continue our present course of technological development without the risk of making the earth unfit for human habitation.

*A.P. Attacks Books.* According to the chief librarian, library books in the county borough of St. Helens wear out twice as quickly as in some parts of the country simply because of air pollution.

# Robert Edwards, M.P., Introduces his Air Pollution Bill

In the House, on 22 November, 1966, Mr. Edwards introduced his Air Pollution Bill. His speech, in full, was as follows.

That leave be given to bring in a Bill to make further provisions against the pollution of the air; to confer further powers upon local authorities in this respect; to amend the law with regard to diesel and other exhaust fumes; and for purposes connected therewith.

Members of Parliament have great privileges. Their task invariably enables them to work for the good of many people and it is, therefore, a fulfilling task. Occasionally, however, Members are greatly frustrated because they fail to deal with simple problems which affect their constituents and many others. During my 11 years as a Member, I have been frustrated on only two occasions. One was when a constituent of mine purchased a house and mortgaged it for 20 years. The house broke in half and became uninhabitable. He had nowhere to live, but he still had to carry on paying his mortgage for 20 years.

There was nothing I could do to help this good man and his family, and I was greatly frustrated. To get rid of my frustration, I submitted a Bill under the Ten Minutes Rule, and I believe that now, as a consequence of it, what happened to my constituent cannot happen again to other people if they take normal precautions.

Today, I ask leave to bring in a Bill to deal with the pollution of the air. Again, I have been greatly frustrated. because, for a number of years now, I have been trying, with others of my hon. Friends and people outside, to protect many thousands of my constituents from smoke, dust and smells which come from an important foundry in the locality where they live. None of our Acts of Parliament, however, enable us to protect these good people.

To save the time of the House, I shall read from a letter from a constituent which puts the situation in clear perspective. She writes:

> "May I draw your attention to our plight? I live in a council house. It is a lovely house which has only been up seven years. The trouble is that there is a foundry behind us which blows filthy smoke and dirt all over us day and night. When I hang out my washing I get my lungs full of filthy smoke. Some days I cannot put out the washing. The other day I was coming back from shopping and found the main road covered in fog. This fog was due to damp smoke converting itself into fog."

She goes on to say:

> "People who come to my house when the dirty smoke is blowing all down the street say to me, 'I would not live here if the rent was free'. The doctor came to see me and he said, 'It is enough to kill you, living in this filth. No wonder you have bronchitis'."

That is one of many scores of letters which I have received from constituents. These people, on an estate of about 600, have formed an association to try to abate the nuisance. They have petitioned the Prime Minister. They have petitioned the local authorities. I have been successful in getting two local authorities to set up a joint committee to try to persuade the foundry to do something about the dreadful nuisance.

All our efforts over five years have been completely abortive because the Acts of Parliament dealing with pollution of the air do not enable us to deal with this kind of situation. In many areas of our land we are losing control of our environment. As I have said in the House on other occasions, when people lose control of their environment they become slaves of that environment. We do a lot to guarantee that the water we drink is clean, but the air we breathe is even more important than water. I therefore wish to bring in a Bill to make modest amendments to existing Acts and regulations so that we can deal with the rising tide of air pollution.

Recently, the Society of the Chemical Industry stated in a report on air pollution that it still costs the country after 10 years of the Clean Air Act. £350 million a year because of air pollution, and in that report—I agree with it—the Society complained that the facilities and opportunities provided by the Clean Air Act are not being fully used.

For example, the councils set up under the Act are not vigorous enough. They should be responsible for annual progress reports to the House. Although in 10 years, over 2,000 areas have been declared smokeless zones, hundreds of tons of coal are still being sold in those areas in violation of the law, and there is no means of applying a sanction against the coal merchants. It is only the consumer who has to face the possibility of prosecution.

So the Act needs amending to put some penalty on coal merchants who know the smokeless zone areas, but who, in spite of that knowledge, violate the laws of this country.

The air is being polluted by smoke and fumes from diesel oil engines, and we require a small amendment to the regulations that cover smoke from motor vehicles. Regulations 80 to 81 prohibit any emision of smoke, etc., which

> "Causes or is likely to cause injury to any person on the road or danger to such person."

A simple amendment to the regulations, deleting the word "danger" and substituting the word "annoyance", would make the emission of diesel fumes an offence, and it would help considerably in dealing with this nuisance.

In America and Belgium, and in many other countries, there are the means and the legislation to deal with this problem. I must not abuse the privilege of submitting a Motion under the Ten Minute Rule, although this is a vast subject which lends itself to a long recital on the evils that arise out of the pollution of our atmosphere. I hope that hon. Members will grant me leave to submit the Bill to the House.

*Question put and agreed to*

Bill ordered to be brought in by Mr. Robert Edwards, Mr. Frank Allaun, Mr. Will Owen, Mr. Geoffrey Rhodes, Mr. Tom Bradley, Mr. Hugh Delargy, Mr. John Horner, Mr. Peter Archer, and Mr. Jack Ashley.

### AIR POLLUTION

Bill to make further provisions against the pollution of the air; to confer further powers upon local authorities in this respect; to amend the law with regard to diesel and other exhaust fumes; and for purposes connected therewith, presented accordingly and read the First time; to be read a Second time upon Friday, 28 April, 1967, and to be printed. [Bill 135.]

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## A LETTER THAT MADE OUR DAY

*To the National Society for Clean Air*

Dear Sirs:

I always disliked taking down curtains to wash them because it was such a messy job. The tops of the curtains felt stiff and gritty and my hands were blackened. The washing water instead of smelling pleasantly of soap suds smelt of soot.

This year when removing the curtains for washing they felt lighter to hold, my hands were not soiled and there was no smell of soot from the washing water: last autumn this district became smoke controlled.

Thank you, N.S.C.A.
Yours faithfully,
H. E. T.

# Air Pollution on Tees-Side

## *Committee Reports Favourable Trends*

The Tees-Side Clean Air Committee is an active and practical organization of 17 local authorities in the area. At a meeting on 6 January, 1967, at West Hartlepool a report was received from its Technical Sub-Committee on pollution over the period 1956-1965, as shown by the various measurement instruments in use.

The report shows that during the period under review grit and dust emissions, most of which come from industrial premises, have decreased by 42 per cent over Tees-Side as a whole. The decrease has been greatest over the industrial parts of the area, where there has been a reduction in deposits of more than 46 per cent. Grit and dust deposits have either decreased or remained static at 51 out of the 55 sites at which gauges are situated. There were, however, six sites at which although over the ten-year period deposits had decreased, the downward trend appeared to have been halted during the past few years and they were now showing a tendency towards an increase in deposits. Three of these sites were in Eston, one at South Bank Road, Middlesbrough, one at Warrenby and one at West Hartlepool.

Since 1962 ferric oxide readings have also been available from these gauges. Ferric Oxide forms a part of the dust emitted from iron and steel works, iron foundries and engineering works. The report shows that over the period since 1962 there has been an increase of 20·9 per cent in the amount of this material deposited over Tees-Side.

It is pointed out that at the beginning of the period there was some recession in the iron and steel industry, but figures quoted in the report show that over the same period as the 20·9 per cent increase in ferric oxide occurred there was an increase of 11·2 per cent in iron and steel production.

The Sub-Committee say that this would seem to indicate a need for pressure to continue to be exerted on the iron and steel manufacturing industry and other metallurgical industries such as iron foundries and engineering works to ensure the provision of adequate and efficient dust suppression equipment.

Smoke is measure by air filters, of which there are 26 on Tees-Side. These are sited in the following types of areas:— high density residential, low density residential, industrial, commercial and smoke control areas. The readings from these instruments show that the amount of smoke in the air is related to the density of housing. Over Tees-Side as a whole there is a daily average of 175 microgrammes of smoke per cubic foot of air in high density residential areas, as compared with daily averages of 88 microgrammes per cubic foot in industrialized areas and 97 microgrammes per cubic foot in low density residential areas. There were two sites where air filters were in operation both before and after smoke control orders were made. The readings showed that the making of an area subject to smoke control had the effect of reducing smoke pollution by 60 per cent.

The Technical Sub-Committee recommended that local authorities should be encouraged to press on as quickly as possible with the making of smoke control orders.

The report states that the majority of the sites at which recordings of sulphur dioxide are taken have not been operating long enough to allow of any reliable estimation being made of the trends. They do, however, point out that unless there is a considerable increase in the use of gas or sulphur free oil, or the discovery of practicable means of extracting sulphur from flue gases, the amount of sulphur dioxide emitted to the atmosphere of

Tees-Side will increase in proportion to the increase of the use of fuel. They stress that this need not lead to increases in ground level concentrations if local authorities use their powers under the Clean Air Act to enforce chimney heights which are sufficient to permit of adequate dispersal of the gases.

The Sub-Committee draw attention to the amount of pollution from road vehicle exhausts, which they say must be increasing as the number of vehicles in the road increases, and they report that they propose to investigate the feasibility of carrying out routine testing and recording of pollution from this source.

As far as pollution from other chemicals is concerned, they observe that there are no means available for monitoring the amounts and type of them in the atmosphere, and that they have therefore no means of ascertaining whether these are increasing or decreasing.

The annual report of the Sub-Committee, for 1966, was also presented at the same meeting. This consolidates the work of the constituent authorities. Among much other information it records that 755 observations were made on all types of emission, and that 376 interviews and visits to plants took place. The types of premises dealt with are listed—and a remarkably long and varied list it is. Action taken to secure improvements in the emission of smoke, dust and fumes is also listed.

Smoke control areas in operation or proposed are given. The total number of premises in operative orders is given as 24,596.

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## AIR POLLUTION IN LONDON

*Decrease in both Smoke and $SO_2$*

The annual report for 1965 of the Scientific Adviser, Greater London Council, includes as usual a section on air pollution. The most important paragraphs are the following:

"As compared with the previous year, the results for 1965 for the Inner London area by the volumetric method indicated a reduction of 14 per cent in the average sulphur dioxide concentration in the air. Partial confirmation of this was provided by the lead dioxide method. The average concentration of smoke was reduced by 23 per cent. This substantial improvement occurred during the winter months, and there was little difference between the low summer levels for the two years.

"Although the degree of air pollution is influenced by factors such as season and weather, it is evident that the main cause of improvement in the London atmosphere in recent years has been the increasing use of clean fuels and of efficient heating appliances. There are still many domestic premises burning smoky coal and it seems that these objectional chimney emissions will only be finally eliminated through the completion of the London Boroughs' programmes for smoke control areas under the Clean Air Act."

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### Domestic Heating Society

The Domestic Heating Society, formed a few years ago in London, is now well-established and has become a company limited by guarantee and non-profit making. It has had, and is to have, a varied programme of monthly meetings during the present winter session, including "Central Heating and the Consumer", "District Heating", "Radiator Testing", "Electricaire", and "Pressurised Central Heating Systems". Meetings are held at the Bedford Corner Hotel, Bayley St., W.C.1. The Society extend a cordial invitation to anyone interested in domestic heating to attend their meetings. Particulars of the Society from the Hon. Secretary, D. E. Pither, 34 Mortimer St., London, W.1.

# *Air Pollution Measurement*

## Talk by Dr. S. R. Craxford

At a meeting of the N.S.C.A. West Midlands Division at Birmingham on 30 November, 1966, with Alderman Mrs. Ilsley in the Chair, a talk was given by Dr. Craxford of the Warren Spring Laboratory.

Dr. Craxford said that clean air promotion had begun with the objective of removing a hazard to health but was now pursued for its amenity value in reducing the general dirtiness of the environment. Measurement of the pollution was necessary for the following reasons:

1. To pin-point the blackest areas where action should be taken most vigorously, and to which priority should be given in supplies of smokeless fuels;
2. locally, also, to monitor sources of emissions of grit and dust, so that the law may be brought into action to stop them;
3. nationally, to assess reasonably tolerable levels of pollution for different types of district;
4. internationally, so that the international standards which will ultimately be established will be practicable ones; and
5. in regard to sulphur dioxide, although control was now limited to control of chimney heights, records must be kept so that any future development in control could be applied to the worst polluted areas. It was important to know how ground level concentrations varied from year to year.

Measuring apparatus of simple design had been adopted and was subject to known limits of error. Misuse or lack of care in operating must be kept to a minimum if the results from such simple apparatus were to be of value. Comparisons of levels of pollution must be carefully made to ensure that like was compared with like.

Dr. Craxford referred to the accompanying table, which shows the differences, for similar types of site, between the north and the south of England. The differences was due to the higher domestic coal consumption. Investigations had shown that this was not due to weather differences but to the habit which led to the unnecessary burning of large quantities of coal, particularly in the mining areas.

| *Type of site* | *North of England* | *South of England* |
|---|---|---|
| High density housing, with or without industry, surrounded by other built-up areas . . . . . . . . | 319 | 153 |
| Industrial areas with or without high-density housing | 273 | 114 |
| Commercial or other central heating areas . . . . | 243 | 122 |
| Medium density housing, inner suburb or housing estate, surrounded by other built-up areas . . . . | 239 | 111 |
| Low density housing, or medium density housing interspersed with or surrounded by open space . . . . | 195 | 87 |

**Smoke concentrations at different types of site, November and December, 1964. Microgrammes per cubic metre**

A further table showed that domestic coal consumption per head of population was 0·70 ton in the North and 0·27 ton in the South. Included in the South was the London region, for which the figure was only 0·13 ton.

Pollution figures for January–February, 1964, in areas of dense housing with industry, were given as follows ($\mu$gm/m$^3$):

| | *Smoke* | *$SO_2$* |
|---|---|---|
| North | 325 | 277 |
| Midlands | 217 | 211 |
| London | 246 | 364 |
| South | 147 | 135 |

London was still high, but it had to be remembered that the London conurbation was very large and densely populated.

Dr. Craxford instanced some effects as follows:

In Hyde Park, London, there was 107 microgrammes per cubic metre less smoke in the centre than in the outer edges. The City of London, a complete smokeless zone, was 26 per cent cleaner than its surrounding areas.

There has been a reduction of 24 microgrammes per cubic metre in smoke level in Hackney during the last four years, although Hackney has a long and narrow shape.

Measurements in Sheffield showed that in similar sites smoke concentration was 25 per cent less in smoke control areas than in areas not controlled. Similarly elsewhere reductions varied from 22 to 40 per cent.

'Just think - once this was nothing but raw wilderness!'

"It's all right . . .breathing is okay as long as you don't inhale.'

## NO LAUGHING MATTER

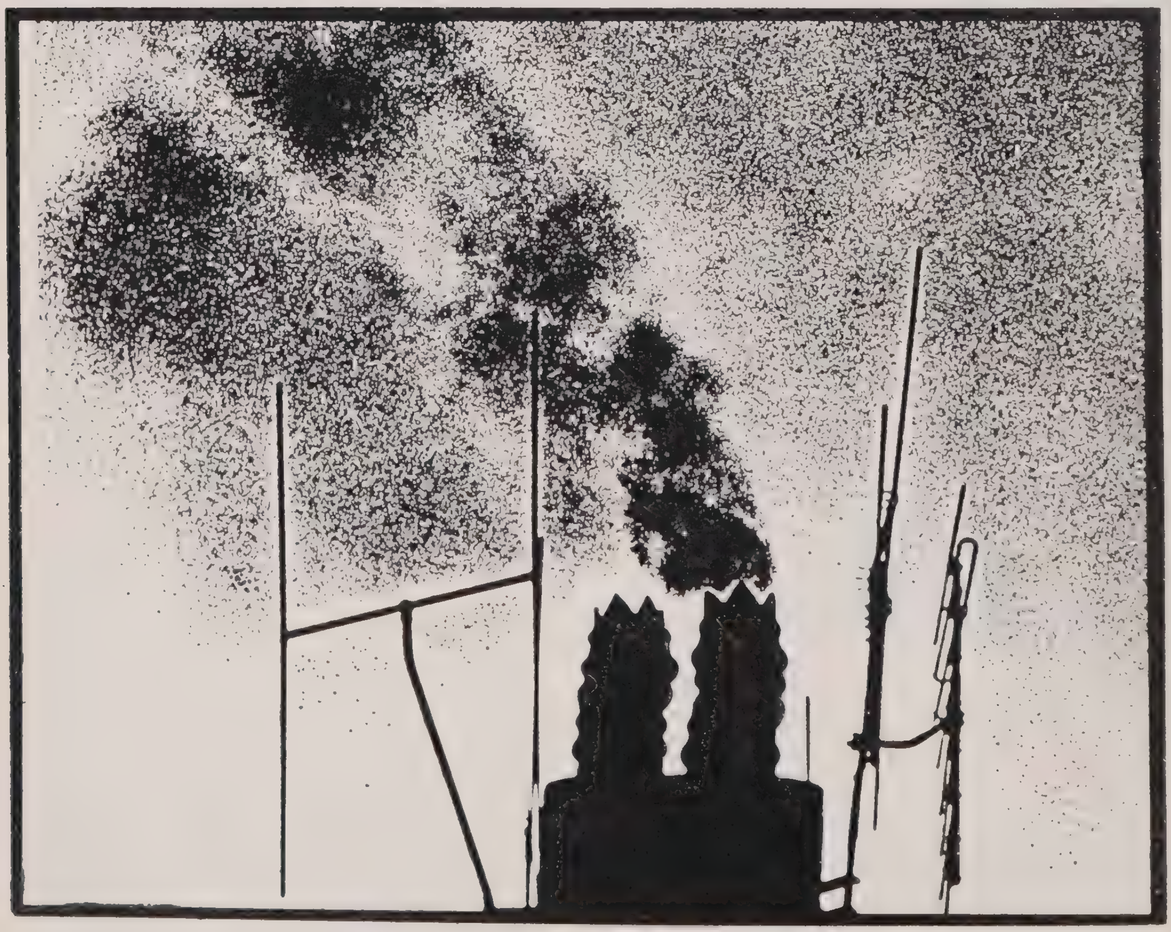
**This is the title of a collection of sixty cartoons an air pollution culled from American newspapers and magazines, published in book form by the Department of Health, Education, and Welfare as part of its intensive propaganda campaign for clean air. We reproduce what we thought were two of the best**

Photo above by D. Mellors, Sheffield. *Below, by Joe Thomason, Taunton.*

## Smoky Chimneys Photo Competition

The journal *Photo News Weekly* runs a "weekend assignment" competition, in which specific subjects are required. Recently the assignment was for photographs of smoky chimneys. There was an interesting set of entries, and *Photo News* has kindly donated both the winning and the non-winning prints to the Society's photo-library. We illustrate two of the three prize winners. For reproduction purposes and any other uses it should be noted that the copyrights remain with the photographers, for both these and any of the other photos.

For the technically-minded, it may be explained that the striking domestic smoke picture by Joe Thomason, of Taunton, has been made by one of the new techniques in which from the original negative a lith positive is made, followed by a lith negative, to remove all intermediate tones and produce a "gritty" effect in the sky resulting from the grain of the film.



# Clean air is automatic with clean electricity

**For clean air areas the most natural choice is clean electricity for all home and water heating. Electricity is the only fuel that causes no combustion in the home at all. Always there to be switched on. Nothing to store. Nothing to dispose of.**

### THREE ELECTRIC CENTRAL HEATING SYSTEMS TO CHOOSE FROM

Electric central heating is automatic, simpler and cheaper to install than other systems. One of them is bound to be suitable for a particular house. All run on half-price electricity. All, of course, comply with the Clean Air Act.

**Floorwarming:** Cheap to install at construction stage in new houses, built into the floor. Easily controllable, and economical to run.

**Electricaire:** Warm-air central heating with one thermal unit and ducts built into the fabric of new buildings, controllable room by room.

**Storage radiators:** The most easily installed and practical system for existing houses. Cheapest system of any to install. Wide variety of storage radiators to choose from.

### WATER HEATING, TOO

Electric water heating is extremely economical when a correctly installed immersion heater, or self-contained water heater is used. Various types are available, suitable for whole-house systems, or single-room installations. Your local Electricity Board will be glad to give any advice on heating problems caused by the Clean Air Act. Ask them for a copy of the free leaflet 'Smoke control areas . . . how electricity can help'.

ISSUED BY THE ELECTRICITY COUNCIL, ENGLAND & WALES

## Congress Proceedings

The original printing of the International Congress Proceedings, Part 1—containing in full all the 91 papers presented at the Congress last October—has been completely sold out. Orders for copies have continued to come in from all parts of the world, and as the volume is of such importance it has been agreed to print a second edition, despite the financial risk. It will shortly be available, as before at a price of £2 per copy. Also available soon will be Part 11 of the Proceedings, containing the important Rapporteurs' reviews, the discussion, chairmen's remarks, opening and closing addresses, etc.

### Scottish Clean Air Council

Councillor George A. Snodgrass, of Glasgow City Council, has been reappointed chairman of the reconstituted Clean Air Council for Scotland.

### City and Guilds

The City and Guilds of London Institute has issued its regulations and syllabuses for the examinations in six fuel subjects—Boiler Operator's Certificate (75), Boiler House Practice (76), Combustion Engineering Practice (77), Steam Turbine Plant Operation (192). Steam Utilization Practice (29) and Power Plant Operation (167). Information from the Institute at 76 Portland Place, London, W.1.

### Mintech Supports Electric Cars

Speaking to the Motor Industry Research Association recently, the Minister of Technology, the Rt. Hon. Anthony Wedgwood Benn, M.P., said that some of the vast resources of his expanded Ministry should be used to help the British motor industry. His first priority for research and development was on vehicle safety, and his second "the evolution of a practicable electric car for use in our cities." "Electric cars", he continued, "will bring peace and atmospheric purity back into the centre of our urban environment."

### New British Standard for Steel Chimneys

A comprehensive guide to the design of steel chimneys is provided by a new British Standard published this week.

B.S. 4076: *Steel chimneys* is aimed at standardizing the calculations and other design considerations for chimneys, which at present vary considerably depending on the designer. All aspects of design are covered, including permissible stresses, choice of materials, wind loading and stability; extensive coverage is given to the choice of lining materials and to external insulation. Special requirements such as seismic loading or sub-zero conditions are not included.

Steel chimneys with welded joints, which are increasingly used, have a relatively smooth surface and thus in certain cases are prone to wind excited oscillations. An appendix provides a concise guide to the likely effects of wind in inducing oscillations, and the ways in which this may be overcome. The calculation of frequency and critical wind speed for both sway and ovalling oscillations is described.

A second appendix gives suggestions for the inspection and maintenance of steel chimneys.

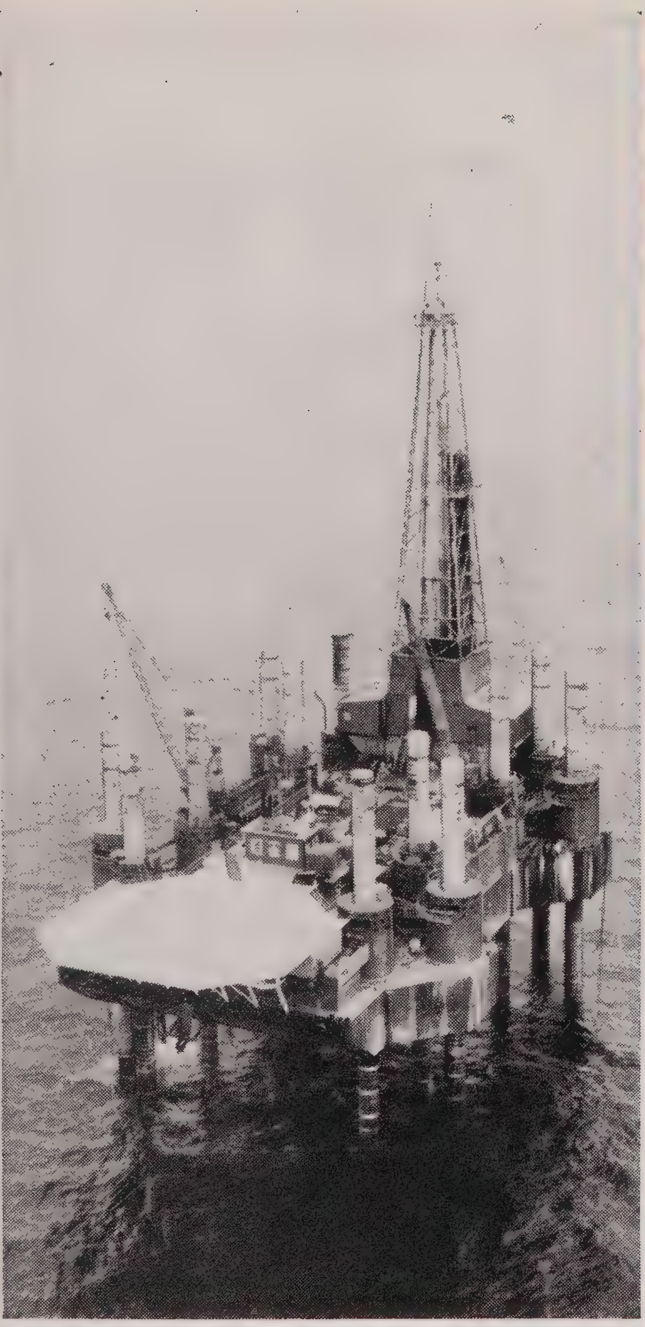
Copies of B.S. 4076 may be obtained from the B.S.I. Sales Branch, Newton House, 101/113 Pentonville Road, London, N.1. Price 8/- each (postage 9d. extra will be charged to non-subscribers).

### Smoke Control Area Proceedings

The first case in which Dartford Borough Council had taken proceedings against a resident under the Council's smoke control order was heard at Dartford Magistrates' Court on 5 January. The defendant was accused of using non-smokeless fuel in one of the fires at his home on 11 November. He pleaded guilty and was given a conditional discharge.

### Low Sulphur Oil

The Consolidated Edison Company, U.S.A., has been offered a fuel oil that has less than half the sulphur contained in the oil it now burns to generate electricity—but, said the company, it would cost $7·5 m. more a year. The offer followed conferences with the authorities seeking to reduce sulphur gas emissions in the New York metropolitan area.



Above: Mr. Louie, the North Sea drilling rig which discovered gas for the Gas Council—Amoco Group.

Rich reserves of natural gas under the North Sea will transform the future for Britain's fast developing Gas Industry. Already the exploitation of new manufacturing techniques based on oil and the scheme for importing methane from North Africa have given the industry an entirely new look. Together, these advances promise ample supplies of gas at increasingly competitive prices.

**High Speed Gas for clean air zones**

Domestic heating is the most important consideration when a district becomes a Smoke Control Area.
Consider the advantages of gas. Most homes use gas for cooking. A clean, smokeless fuel is on tap. The installation of radiant-convector gas fires providing automatic, efficient, labour-free heating is a simple matter. They are as cheap to run as traditional fires and because tariffs improve as more gas is used, the householder gains additional economies. Gas appliance sales are booming, particularly those for heating the home. The public wants this clean, convenient, economical fuel. It is the ideal answer to smoke control problems. Gas Boards offer a comprehensive service and have helped many local authorities with advice on clean air conversions. The Commercial Manager of your Gas Board would be pleased to help you.

***HIGH SPEED GAS***

# Reducing Petrol Engine Emissions

## *New Carburettor System*

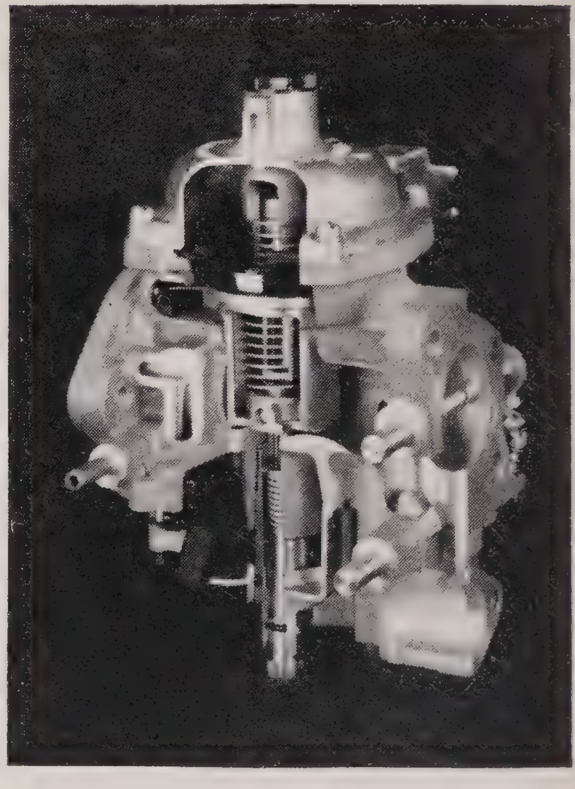
The reduction of carbon monoxide and hydrocarbons from the exhaust gases of petrol-driven vehicles is becoming increasingly important now that the U.S.A. has led the way by imposing stringent standards. In our last issue (page 117) we described a new electronic petrol injection system, developed in this country. This system replaces the carburettor and is said to have important advantages over it. Nevertheless, it may be more expensive, and progress may be made also by development in the carburettor itself.

Thus Zenith Carburettor Co. Ltd. has issued details of the Zenith Duplex carburettor, a cutaway model of which we illustrate. The main problem of pollution in the exhaust gases arises when the engine is idling decelerating, or otherwise operating under part-throttle conditions. The fuel/air mixture is then not completely burned, and the unburned gases pass into the exhaust, both causing pollution and wasting fuel.

The Zenith Duplex has a main throttle, which is accurately fitted to seal off the main carburettor bore completely until an auxiliary throttle reaches two-thirds of its travel to the open position, when the main throttle is mechanically opened. The auxiliary throttle is clearly visible in the photograph and is mounted vertically below the main throttle.

For idling and decelerating conditions the fuel/air mixture metered by the carburettor is forced to travel through the secondary tract. It then passes into a swirl chamber, heated by the exhaust. The heat, together with the internal design of the chamber, ensures a thoroughly mixed and vaporized mixture which is then fed to the main gallery of the induction manifold ready to be inspired by the engine. The swirl chamber is the vital part of the system.

Zenith state that they are confident that they can meet the exacting standards required by the California State authorities (which are more severe than the Federal standards): which means the exhaust emissions must remain within the specified limits for 50,000 miles, with only one tune-up permitted at the 25,000 mile mark.



*Cutaway model of the Zenith Duplex carburettor*

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### Local Government and Smoke Control

In its evidence to the Royal Commission on Local Government in England, the Ministry of Housing and Local Government states that no major changes in respect of clean air are envisaged, but the fact that many people resent accepting smoke control in the face of pollution from nearby areas suggests that there should not be more than one clean air authority in a conurbation or continuous urban area.

# *News from Industry*

## ELECTRICAL INFORMATION SERVICE

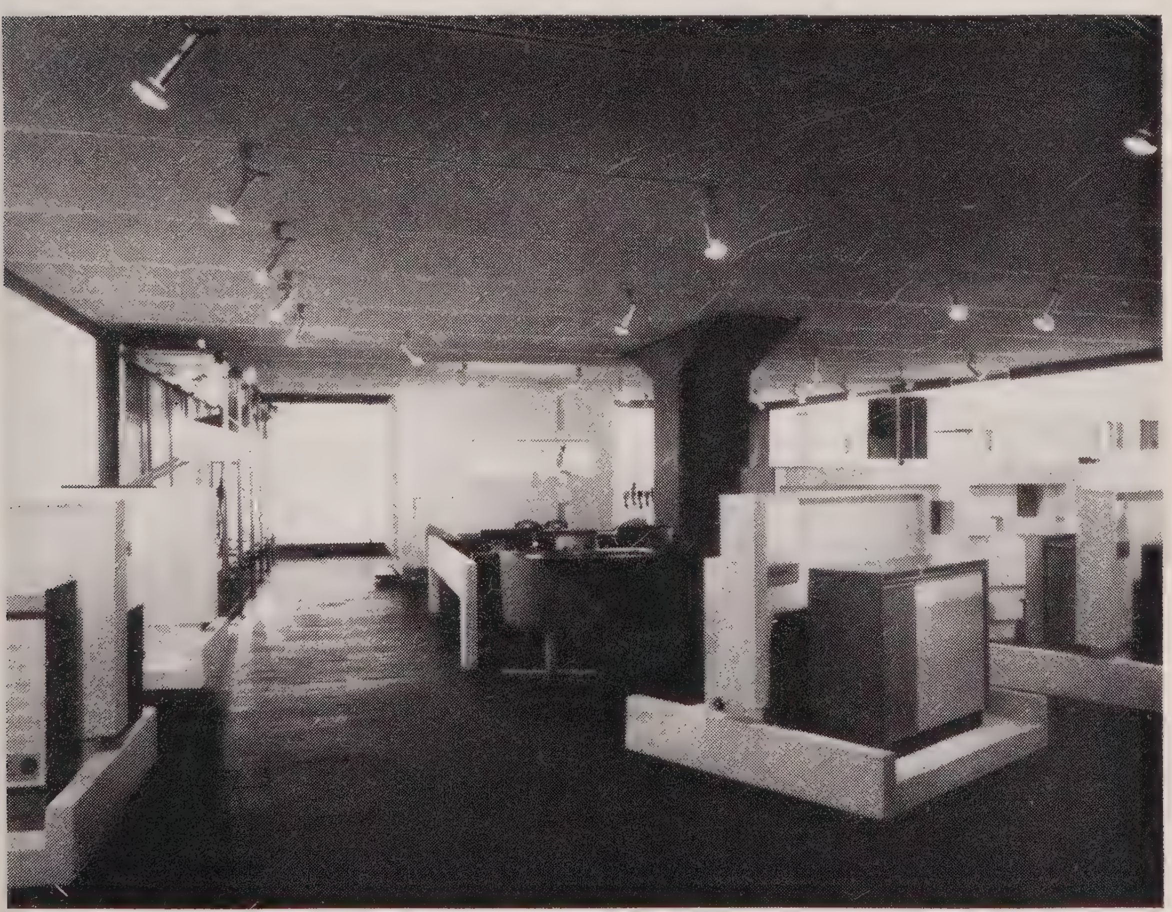
A new service of information and advice for architects, builders, engineers and anyone else concerned with specifying equipment for all types of buildings has been opened in London. It is the Electricity Council's completely re-designed electrical section at the Building Centre, Store Street, W.C.1.

The official opening was by Dr. John Weston, Director of Building Research, the Building Research Station on 26 January, 1967. Professor Sir Ronald Edwards, Chairman of the Electricity Council, was in the chair.

The new electrical section has been planned for the professional and provides functional displays of equipment, data about all main electrical services and has the most comprehensive index of manufacturers of electrical equipment in the country. Fully up-to-date technical literature is available on-the-spot and experienced staff are in attendance. The section is linked to the Council's headquarters engineering, industrial, agricultural and other advisory services and also directly to Electricity Boards all over the country.

### Site Electricity

The first of a series of displays on special interest subjects is an "Elec-



*The new electrical section at the Building Centre* tricity in Building" feature showing power tools and plant to cut down the work load on construction sites, site lighting to give a longer working day and heat applications which permit work to proceed in bad weather. The feature also shows modern control units and electricity distribution systems for site use. Information is available on the procedure for obtaining site supplies formulated by the Electricity Council's joint action group with the building industry. Recommendations made by a working party of this group have formed the basis of a pending British Standard Specification and Code of Practice for site distribution equipment.

The latest information about modern electric central heating is illustrated in displays covering three off-peak and six ordinary tariff systems. The section itself is heated by two different methods of off-peak floor-warming and in one area seven different floor finishes are used. The consulting room and adjacent areas are heated by an Electricaire unit fitted with a filter which arrests dust particles. Another Electricaire unit illustrates the flexibility of this latest, most economic warm air heating system. No flues are necessary and the method offers freedom of planning to the architect, simplified construction to the builder and simplicity and control in operation plus economy of running for the householder.

Storage radiators, the most popular of all automatic central heating systems for existing houses are illustrated by a range of the latest appliances. A selection of fully controllable storage fan heaters is also shown.

Ordinary tariff heating systems displayed include two methods of ceiling heating, carpet underlays, built-in fan heaters, ducted warm air, skirting heating and oil filled radiators.

## Electricaire Manual

Electricaire—warm air electric central heating is now well established and since it was first introduced in June 1965 some 20,000 systems have been installed or are on order. To enable the industry's heating engineers and heating contractors to be certain that their customers will be completely satisfied with Electricaire and get the best out of it, both economically and operationally, the Electricity Council has produced a comprehensive Electricaire Design Manual which deals with all aspects of electric warm air heating from basic theory to detailed calculations for actual installations.

Electricaire is a central thermal storage warm air heating system which operates on cheap off-peak electricity. It is simple, clean and unobtrusive and the householder has complete control over which rooms he will heat and how much he will heat them. It is completely automatic—the Board's timeswitch determines when the energy is supplied and a core thermostat controls the quantity taken. A room thermostat controls the air temperature at the level desired by the householder, while a fan speed switch gives control over system operation. Heat can be directed into any room by opening or closing the appropriate supply air register, and the boost device provides rapid pre-heating.

Electricaire can be used in all types of building, and is particularly suitable for modern lightweight buildings. It is cheap to run and has the decided advantage that the householder is in full control of expenditure. In fact, the annual running cost of a 6/8 kW installation can be as low as £25. The capital cost of such an installation would be about £125, and this would provide full Parker Morris standards of comfort in the average-size house or flat.

Electricaire is based on a centrally sited unit in which air is heated and distributed to the individual rooms by duct. Air is drawn from the warmed rooms through return-air grilles by a quiet-running fan and is filtered before being passed to the heating unit. Here, it is heated to a predetermined level, the final air temperature being controlled automatically The warmed air is then supplied to the rooms to be heated by ducts through low-level supply-air registers.

Copies of "Electricaire Design Manual—Domestic Systems" are available from Electricity Boards or from the Electricity Council, EDA Division, Trafalgar Buildings, 1 Charing Cross, London, S.W.1.

### Condensation

A new publication—"Condensation in the Home"—which deals with the causes and methods of preventing condensation, has been produced by the Oil Appliance Manufacturers Association.

The need for adequate ventilation and the effects of humidity and insulation are among the subjects which are examined by the author, Frank Preston. Tabled information about the water vapour produced by electric, gas and paraffin non-flued room heaters is shown.

Copies, at 3s. each, are available on request to the Oil Appliance Manufacturers Association, West End House, Hill's Place, London W.1.

## "RINGHEATING" SYSTEM FROM HOLLAND

Recently demonstrated in London, "Ringheating" is a new development in gas-fired central heating, and was introduced into the U.K. six months ago. It offers the warmth of radiators throughout the home and the cheerful flames of a modern-styled stove unit in the main room.

The decorative stove, designed as a piece of furniture, acts as the source of heat and can supply any number of radiators—giving full central heating throughout the home.

An advantage of the Ringheating system is that it is easy to install—whether it is fitted into an existing house or one that is being built.

Ringheating Limited offer fully guaranteed temperatures for each installation of their central heating system. They are able to do this because they collect more data when preparing an estimate than is customary and use a computer to work out the correct requirements for full central heating.

As the company has had a number of years experience with natural gas in Holland, the equipment sold in Britain will not need conversion when North Sea is introduced in the future.

The stove units, the heart of the Ringheating system, are available in several heating capacities (40, 52, 68 and 80,000 Btu/hr) and in four different designs. The models have an attractive front panel in fire-proof glass through which can be seen the flickering flames.

### Installation

The easily installed stove and radiators are connected in a ring-circuit by means of a continuous square pipe. Water is circulated through this pipe by a noiseless pump which can be fitted out of sight, because it can operate at any point along the circuit. The piping is small-bore (only $\frac{7}{8}$ in. square) and it is not necessary to fit it under the floor.

Installation of the Ringheating system takes place without any damage to property. In order to fix the entire system, only a few small holes need be bored through connecting walls. Because the piping is square in section, it is hardly noticeable when fixed against or on top of the skirting. If possible, radiators are placed beneath the windows in the rooms because this provides the most efficient means of heating and avoids cold draughts.

To ensure correct and safe installation of the system all fitting is done by Ringheating's own employees who have been fully trained at the factory in Holland. This also means that the installation can be done more quickly and dependably.

### Control

A room thermostat is an integral part of the system and the required

*The Ring-heating stove unit installed*

temperature is achieved automatically. As soon as this temperature is reached, the stove reduces the size of the flame maintaining the temperature level economically. In the rooms with radiators the temperature level is controlled by radiator valves so that it can be reduced either partially or completely in a room where heat is not needed.

As the system is completely controllable, full warmth can be had just in the living room with all the radiators shut off, or some or all the rooms can be heated.

Another advantage of the Ringheating system is that the full heat capacity is instantly available in the living room because the main unit provides immediate radiant and convected heat. As the system uses only a very small amount of water the radiators heat up very quickly bringing warmth speedily to the other rooms.

Production of the Ringheating units is carried out in the company's factory at Leeuwarden in Holland. Each stove is made of high grade metal guaranteeing long life and all burners are made from stainless steel.

In other systems, pipes are usually cut and fitted on the spot in the customer's house. With Ringheating the whole system is set out on a drawing that is accurate to $\frac{1}{10}$ in., and the installation is prefabricated as far as possible in the factory.

The cost of the new system is, of course, dependent upon the heating requirements of the home. However, about £385 would fit an average, three-bedroomed, semi-detached house.

Further information may be obtained from Ringheating, Ltd., Northway House, Whetstone High Road, Finchley, London N.20.

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## L. P. G.

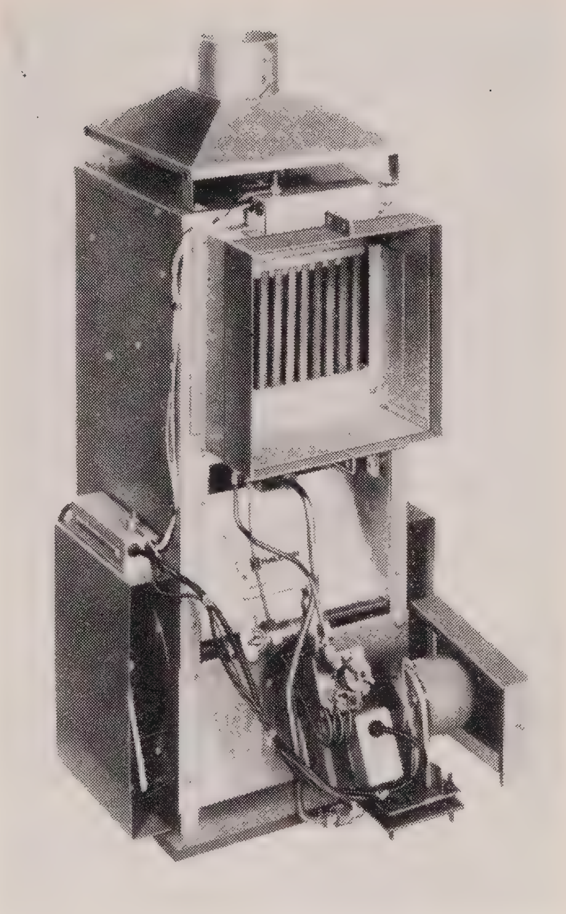
Liquefied petroleum gas, or L.P.G. for short, is an industrial fuel of growing importance for a number of purposes, and W. C. Holmes & Co. Ltd., of Turnbridge, Huddersfield, have recently issued an informative brochure, fully illustrated, on the properties and advantages of the fuel, including the value of L.P.G./Air mixtures. The appliances and equipment required are also described.

### Warm Air Heaters

William Sugg and Co. Ltd. announce the introduction of two new "Halcyon" domestic gas-fired warm air heaters in the 17,000 Btu/h. output range. One of these we illustrate.

These heaters are designed to provide a high standard of selective heating at economical cost, and each will provide full comfort conditions in a principal room or average exposure and construction up to 2,500 cu. ft. volume, or background heating in a house of 1,000 to 1,500 sq. ft. superficial area.

Recommendation is made that a Sugg control panel (supplied as an optional extra) is installed at a convenient point, usually in the kitchen or heater compartment, to work in conjunction with a room thermostat, to control the appliance automatically through two pre-selected heating periods every 24 hours, thus ensuring maximum economy of use.



*The Sugg Halcyon warm air heater (Type 17R)*

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## RADIATION LOOKS AHEAD

An interesting press conference was held by Radiation Ltd. in London last month, for the purpose of explaining and demonstrating how the company is preparing to meet the demand for appliances—for space-heating, cooking, and hot water—to burn North Sea gas. F. P. S. Stammers, Chairman and Managing Director, addressing the well-attended conference, pointed out that it has not been possible for manufacturers to be informed as to the exact composition of the gas which would be supplied to householders in the U.K.

"This position still remains," continued Mr. Stammers, and consequently it is necessary at this stage for manufacturers to assume that their equipment will need to meet all the requirements arising from the different types of gases, including the substitute gases used for peak demands. The Gas Council, quite rightly at this stage, is confirming this view by requiring that current models of appliances shall meet a specification which requires them to pass satisfactory standards based on all these types of gases. Over a very long period, appliance manufacturers have developed their equipment to burn manufactured gas, and have progressively reduced the size and cost of such equipment so that the householders might acquire the appliances at the lowest prices consistent with meeting the standards set for manufactured gas. The arrival of different gases and the provision of burners to accept these gases in addition to manufactured gas has meant that existing models, reduced as indicated to a

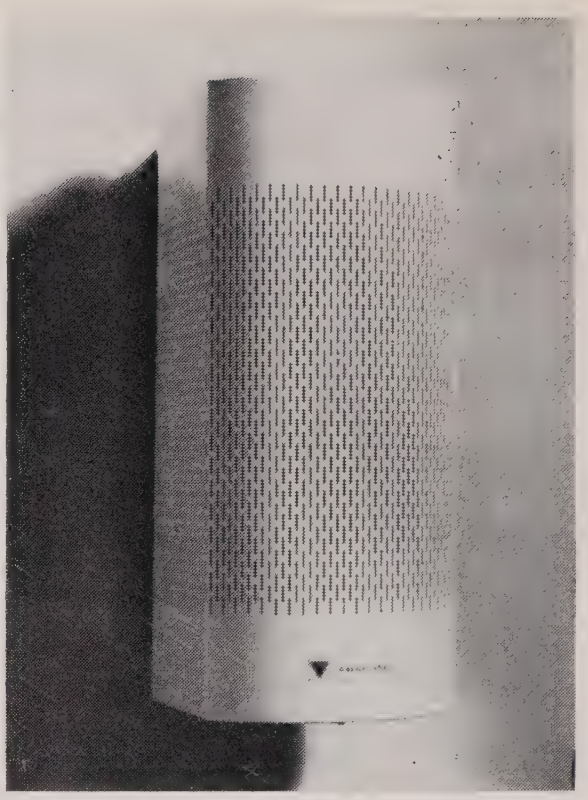
*The new Radiation Northsea G gas room heater*

minimum size, have produced their own problems in that the new gases require a greater space to burn effectively.

"During the last two or three years we have developed a range of burners, and a number of appliances, which can cope with all the gases indicated above, in addition to manufactured gas, and it follows that, once installed, appliances of this type will need little adjustment in the field on the day when the gas supply is changed from manufactured to natural gas. The indications are that to create the additional space and to manufacturer the new burners will raise slightly the cost of the appliances.

"We have already started introducing appliances which will burn any of the gases, subject to an adjustment of the appliance, and we shall, during the next few months, be introducing new models, or modifications of our existing models, so that well before the end of the year all our gas appliances will be intended for use with natural gas, at the same time giving a comparable performance as with the existing manufactured gas."

A demonstration was given of the changing-over of three appliances from manufactured to natural gas usage—a New World 51 cooker, an Ascot 526 water heater, and a Northsea G gas fire. The conversion times were only 6 minutes for the water heater, 11 for the gas fire, and 15 for the cooker.



*The new-styled Ascot gas storage water heater*

Radiation gas fire models now being fitted with universal burners suitable for either form of gas include the Highspeed G "furniture" fire, designed in conjunction with E. Gomme, Ltd., the G-plan people; the glass-fronted Crystalglow, and the BC Ten, described as one of the cheapest available —which makes it of value in local authority housing and in conversions in smoke control areas. A new model, which will be on sale from April next, is the Northsea G, mentioned above. This incorporates a number of new technical features and will sell at less than £25.

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### Electric Resistance Heating

Nearly all manufactured products need to be heated at one or more stages in their production and of all the forms of energy available for this purpose electricity is the most versatile. Several alternative electrical methods of heating are available for critical examination by production teams searching for the best combination of all the factors involved in the economical attainment of high quality and high productivity. The choice of heating equipment involves far more than an estimation of the cost of supplying the heat.

Electric resistance heating provides two methods of applying heat to a product. In one, the product itself forms the resistance and heat is generated directly within it, while in the other, heat is transferred to the surface of the product from an external resistance heater. Only when electric resistance heating is employed is 100 per cent of the potential energy converted into heat.

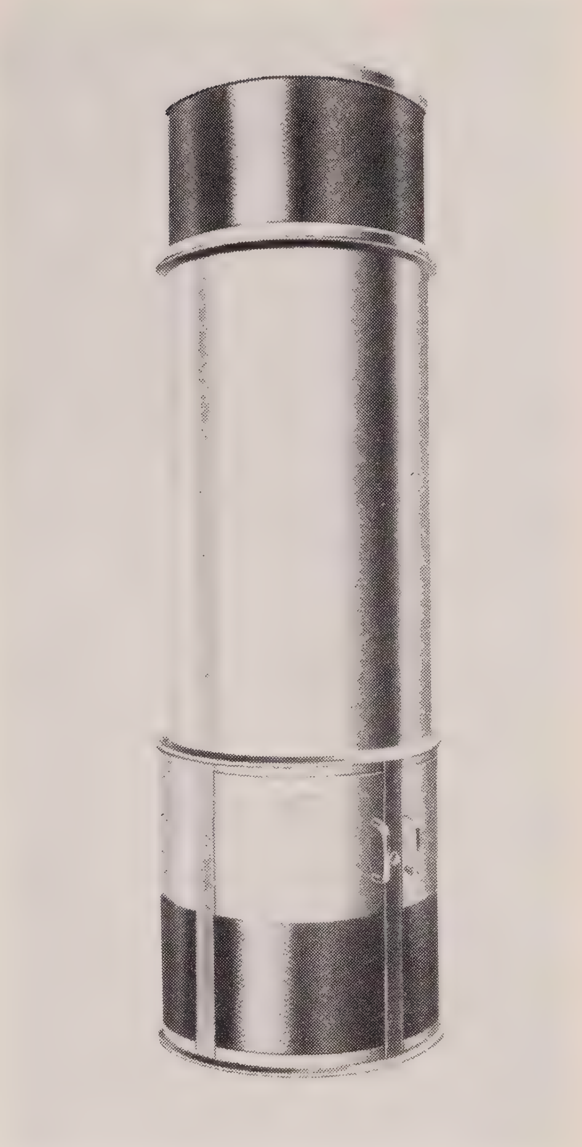
A completely revised edition of "Electric Resistance Heating" has been produced by the E.D.A. Division of the Electricity Council in their Electricity and Productivity series.

The book covers the wide range of electric resistance heating equipment which is on the market today and shows how it can be applied efficiently to meet a great variety of process heating needs in industry. Comprehensive descriptions, accompanied by typical examples of application, of all the main types of electric resistance heating equipment, from large furnaces to small soldering irons, are given. Nearly 200 different equipments are illustrated.

"Electric Resistance Heating" costs 25s. (post free) and is available from Electricity Boards or direct from the Electricity Council—E.D.A. Division, 1 Charing Cross, London, S.W.1.

## Oil-Fired Air Heaters

Illustrated is the "Gemini" 300,000 Btu/h. fully automatic oil-fired air heater for industrial use manufactured by Turbomatic Engineering Co. Ltd., (Land Gear House, 2181 Coventry Road, Birmingham 26). It is a completely new design concept, which it is stated provides more usable heat per square foot of floor area than any other unit of equal capacity. Technical features include compliance with the requirements of BSS 799 part I.



*The Turbomatic oil-fired industrial oil-heater*

It is equally suitable for vertical free standing, wall mounting, or for either low or high level horizontal mounting, free blowing or ducted.

## Focus on Air Pollution

Among many clean air features in recent publications, mention must be made, though brief, of a feature in *Time* for 27 January, on *The Polluted Air*, with a front cover and other excellent photographs, and an article, also well illustrated, called *Clearing the Air* in *The Times Review of Industry and Technology*, January, 1966. The latter, surveying the cost of and harm done by air pollution says "No wonder that the National Society for Clean Air is still campaigning vigorously, as it has done under various names since 1899."

# Electrical Market Place

## Record Domestic Exhibition at Harrogate

The Exhibition Hall at Harrogate, adjoining the Royal Hall, is familiar to many of our members for the Clean Air Exhibitions we have held there. The single long hall has now been duplicated by a parallel hall of the same length, the two being linked together at the centre, giving a fine hall with really generous floor space. (The NSCA will be back again there in 1968.)

The twin halls were filled to capacity in February for the Domestic Electric Appliances Exhibition organized by the E.D.A. Division of the Electricity Council. Although it was open only to the industry and trade it was nevertheless densely thronged by visitors on the day it was visited by the press. Squeeze, freeze, or what you will, the outstanding impression was nevertheless one of an industry in a buoyant, optimistic, enterprising and inventive mood. The exhibition as a whole was excellently designed and harmonious, and the individual stands were attractive and informatively interesting.

Our own special interest was of course in electrical heating, particularly in the storage heaters that qualify for grant in smoke control areas. These are now numerous, and it would be impossible to mention any of particular merit. There are in fact now 70 approved heaters on the market, and the exhibition included 24 new models being shown for the first time. Despite the strict limitations of design inherent in what must be essentially a rectangular black, modern storage heaters are pleasing to the eye, will blend in well with any furnishing scheme, and are functionally first-class. Significantly, they seemed to be on show in greater variety than were direct-heat appliances.

It was reported that during 1966 off-peak electric storage radiator sales had increased by over 43 per cent. Total sales were about 500,000.

*A new 1½ kw electric storage heater, shown at Harrogate, by Heatstore Ltd.*

### Total Electric

After the all-electric home, the industry is now thinking in terms of the total electric city. Speaking at a conference in conjunction with the exhibition at Harrogate, Robert Phillips, Director of the Council's E.D.A. Division, said:

"The new city for 250,000 at Milton Keynes, Bucks, recently announced by the Minister of Housing could be the breakthrough point and become the first total electric city in the world. So could some or all of the six new towns announced for England, the one in mid-Wales and the three in Northern Ireland, all at early stages of consideration. There are also studies being made for new cities each of a million inhabitants on Humberside, Severnside and Tayside, where the total electric concept could be incorporated in many or all of the buildings."

Among the many advantages that this concept would give us, listed by Mr. Phillips, were:

"Swift, silent, comfortable transportation of people and goods, handled electrically by battery electric cars and buses, electrified main line rail services, monorails, goods tugs, elevators, travelators and escalators, would eliminate the now serious fears about poisonous fumes in the atmosphere and, of course, noise. The pouring of harmful products of combustion into the air we breathe has to be halted—and that means eliminating energy systems involving combustion at, or near, the point of use."

## Welcome to Natural Gas

Speaking at a luncheon to the press party, Sir Ronald Edwards, Chairman of the Electricity Council, had some interesting views on natural gas and its uses. He said:

"No doubt many of you are wondering just how we in electricity react to the impact natural gas will make in this country. If you think we are jealous you would be wrong. The electricity supply industry in this country welcomes these discoveries of natural gas, which have not only given the gas industry a 30-year reserve to look forward to but which hold out the prospect that still more will be found, so bringing the country increasing prosperity. Amongst other uses natural gas has a place in this country, as in other countries, as a cheaper fuel for electricity generation. We feel that the 17 million customers that we look after should have their share of it. They must not be excluded just because they want their share of the cheap heat turned into electrical energy. We already have 'coal by wire': in future there is no reason why our customers should not get 'cheap natural gas by wire' too.

"Hitherto it has been a widely accepted view that the broad back of the electricity supply industry could carry social burdens which other industries could not. Competition is now so vigorous that this view, if it were ever valid, is no longer so. But, given fair treatment of the electricity supply industry in financial targets, fuel tax, local authority rates, and so on, the importance of natural gas, viewed as a competitor of electricity, should not be exaggerated. If American experience is any guide, natural gas is not likely to damage the future of the electricity supply industry. In the United States in the last 15 years the natural gas industry has been growing at an average of 8 per cent per annum, while electricity supply has been growing at $8\frac{1}{2}$ per cent per annum. In the domestic sector of sales, which interests most of you, the American gas industry has grown at nearly 9 per cent per annum and the electricity supply industry at nearly 10 per cent per annum.

*A handsome Dimplex wrought-iron firescreen electric fire, shown at Harrogate.*

# Air Pollution Abstracts

**965. Conditioning of flue gases of boiler installations leading to an improved degree of separation in the electrofilters.** (In German) Darby, K. and Heinrich, D. O. (Staub-Reinh. Luft. Nov. 1966, **26**, No. 11, 464-8) Several operating conditions of electrofilters which work with a reduced effective power input can be substantially improved by the injection of small quantities of $SO_3$ into the flue gas. Measurements on full scale plants have shown that the effective migration velocities have been increased by up to 85 per cent. An $SO_3$ conditioning plant, now working for more than two years, has proved that there is no increase in sulphur emission and no additional corrosion problem.

**966. Research on separating sulphur dioxide from hot flue gases.** (In German) Kiyoura, R. (Staub-Reinh. Luft) Dec. 1966, **26,** No. 12, 524-5. A dry method for separating $SO_2$ from hot flue gases is reported. Ammonium sulphate particles, formed after catalytic oxidation and subsequent reaction with ammonia, can be separated by means of suitable filters. Estimated operating costs of the process are quoted.

**967. Fume Control in Rubber Processing by Direct-Flame Incineration.** Sandomirsky, A. G. et al. (J. Air Poll. Cont. Ass. Dec. 1966, **16,** No. 12, 673-6). The application of direct-flame incineration to successfully eliminate a smoke-oil-mist and odour problem in the manufacture of rubber-base rug underlay, is presented. The investigation of various air pollution control processes leading to the development and adoption of the direct-flame incineration system, is covered. The rug-underlay curing process incorporating the direct-flame incineration system with primary heat recovery is described. Results and discussion of a source test to determine the effectiveness of direct-flame incineration in this application are included.

**968. Detection and Prevention of Air Pollution in the U.S.S.R.** (In French) Epstein, D. (Pollution Atmosphérique, July–Sept. 1966, No. 31, 273–283.) A study by a French chemical engineer on her return from the U.S.S.R., on the problems of the toxic amounts of air polluting agents, giving the study methods used by the Russians, and particularly by the team directed by Professor Rjazanov of Moscow. These methods concern CO, $SO_2$ and $HS_2O_4$, N. oxides and 3–4 benzopyrene. After mention of the criteria for standardization in Russia, the methods of detecting the toxic proportions of these polluting agents are given in detail, as are the experimentation techniques used on animals. The tests applicable to mankind and their application techniques are studied in particular. As chronaxy was judged insufficiently sensitive, the Soviet authors resorted to electro-encephalographic methods, which reveal the appearance of an electrocortical reflex for small amounts of polluting agents. These tests involving instantaneous M.A.C. are supplemented by statistically analyzed experiments on animals.

**969. Some Comments on Dust from Cement Works and its Effects on Mankind, Plants and Animals.** (In French) Raymond, V. and Nussbaum, R. (Pollution Atmosphérique, July–Sept. 1966, No. 31, 284–294.) The manufacture of cement, the principles of which are recalled here, leads to the production of large quantities of dust. Basically this dust consists of fine powders of calcium carbonate partially decarbonated, silicates and sulphates in variable quantities. Numerous studies have been carried out on its effects on plants and living beings. These effects have little importance in relation to wild plants and animals. They vary according to climatic conditions. Diseases of the lungs, bronchitis and emphysema have been noted among cement workers. The rare research studies carried out on the population living in the neighbourhood of cement works have given only negative results so far.

**970. The Clean Air Act 1956 with special reference to the Black Areas and Concessionary Coal.** Millar, G. E. (Public Health Inspector, Feb. 1967, **75,** No. 5, 244–8.) The paper describes the problems of a Public Health Inspector attempting to establish smoke control in a district where the main source of employment is mining, and discusses the question of concessionary coal.

**971. The Exposure to Carbon Monoxide of Occupants of Vehicles moving in Heavy Traffic.** Rice, R. M. and Roesler, J. F. (Air Poll. Cont. Ass. Nov. 1966, 16, No. 11., 597–600.) Carbon monoxide and hydrocarbons were sampled at operator's nose height inside vehicles moving in moderate to heavy traffic in six cities. The samples were integrated over 20–30 minutes by collection in Mylar bags. Carbon monoxide and hydrocarbons were analyzed by infra-red and flame ionization, respectively, with instruments at the Continuous Air Monitoring Programme (CAMP) station in each city. Detector tubes for carbon monoxide were also used to determine 5-min. concentrations at suspected high points in the field. Estimates of traffic density were made. Three types of traffic arteries were considered: (1) heavily travelled, wide expressways, (2) main city streets with moderately rapid vehicular traffic, and (3) centre city streets with slow-moving traffic. Integrated half-hour CO concentrations obtained within the vehicles while in traffic were generally considerably higher than the concurrent concentrations measured at the CAMP sites. In-traffic CO values in all cities sampled exceeded 30 ppm in at least 10 per cent of the integrated samples. The range of city averages was 21–39 ppm carbon monoxide and the range of individual integrated samples was 7–77 ppm of carbon monoxide.

**972. Air Pollution and Asthma in Yokkaichi.** Yoshida, K. et al. (Arch. Env. Health, Dec. 1966, **13,** No. 6. 763–8.) In Yokkaichi (in the central part of Japan along the Pacific coast) where electric power stations, oil refineries and petrochemical plants exist, growing numbers of bronchial asthma patients have been observed since the plants were put in operation. At Isozu district, where air pollution is the most severe, the prevalence of bronchial asthma involved 2·3 per cent of the total population and 7·1 per cent of inhabitants over 40. Studies covering the whole of Yokkaichi reveal that the average value of sulphur dioxide by the lead-peroxide method in 13 districts was directly proportional to the prevalence of bronchial asthma. As for chronic bronchitis, increasing numbers of cases were found by mass screening techniques in polluted districts. There were two to six times as many as in non-polluted districts.

**973. The Control of Chimney Heights.** Pitman, C. W. (Publ. Hlth. Inspector, Aug. 1966, **74,** 479–484.) Atmospheric pollution resulting from fuel combustion has a seriously harmful effect upon the environment and upon objects both animate and inanimate within it. Limited by the boundaries of present knowledge the current approach is to ensure that polluting gases are discharged at heights adequate to minimize their effects at ground level. The consequences of this policy have financial implications for industrialists and others whose chimneys are now required to be higher, for public health reasons, than combustion engineering alone would necessitate. There is scope for continuing research to discover practical methods of removing sulphur from fuels; until this has been achieved, local authorities and the general public require to be educated into understanding of the need for, and acceptance of, chimneys of greater heights than have been considered necessary in recent practice. There are good reasons too, for an extension of control of chimney heights beyond the scope of present legislation, which stops short of what is considered necessary in present day conditions.

**974. Bronchial Carcinoma, Air Pollution, Smoking and Lung Cancer.** Lawther, P. J. Trans. Med. Soc., 1965, London, **81,** 158–60.) In 1960 about 200 deaths in England and Wales were reported as due to lung cancer; last year more than 26,000 people died of the disease in this country. This dramatic rise in prevalence, though most regrettable, has furnished research persons with clues concerning the etiology of the disease and has made it possible to discard some unsatisfactory answers.

There would seem to be good reason to blame urban air pollution for lung cancer but there are insurmountable objections to the complete acceptance of this hypothesis. However, a massive survey in the U.S. has revealed an urban-rural gradient in lung cancer mortality among non-smokers. This fact would indicate that an urban factor is operating but whether this is real or merely reflects the existence of better diagnostic facilities and greater clinical skill in towns has yet to be decided. Although the fumes of diesel engines have come under suspicion as a carcinogenic agent, there appears no sound evidence that populations exposed by virtue of occupation to more than average concentrations of petrol exhaust products suffer especially from lung cancer. Also under suspicion are automotive exhaust from gasoline engines and various industrial emissions. The author warns against ignoring such potent new carcinogens as asbestos or the possibility of synergism between air pollution and cigarette smoke and other co-carcinogens. He advises that persons, especially young persons, heed the warnings against cigarette smoking and act accordingly while research on the precise mechanisms by which the tumours are produced is continuing.

**975. Planning for Clean Air.** Craxford, S. R. and Weatherley, M-L. P. M. (J. Town Plan. Inst., **52,** 144–5.) Describes how the pollutants grit and dust, sulphur oxides and carbon monoxide are produced and how the first three are dispersed from (1) tall isolated chimneys, (2) industrial chimneys associated with buildings of comparative height and (3) domestic chimneys. The effect of abnormal weather conditions is briefly described. The siting of new towns and industry and the role of town planning in helping to prevent pollution especially in the domestic and commercial side of the town are discussed.

**976. Refuse Burning.** (In German) Wolf, M. and Jacob, J. W. (Brennstoff-Waerme-Kraft, April, 1966, Dusseldorf, **18,** (4) 169–70). This is an annotated bibliography on refuse burning. Fifty-seven references cover technical problems and processes, descriptions of plants already built, new plants either being built or planned, and the current state of the art in other countries of Europe and the U.S.A. Subjects treated include chlorine corrosion in refuse fires, waste burning with and without heat utilization and combinations of composting and burning. New plants in various cities in Germany with capacities of up to 360 tons/day are planned; one in Nurenberg will produce 27–34 tons/hr. of steam.

**977. The Performance of the B.C.U.R.A. Fully-Automatic Smokeless Stoker for Central Heating.** Burke, S. A. and Colling, K. E. (J. Inst. Heating Ventilating Engrs. July, 1966, **34,** 114–28.) Performance of a new type of chain grate stoker is described. The boiler-heating efficiency (combustion and heat transfer to water in the boiler) was 73 per cent at full firing rate and 81 per cent at 1/20 of full rating. Development of a new air-cooled ignition arch raised these efficiencies to 78 and 85 per cent respectively. Smoke emission is extremely low; the optical density is less than 0·01. The high degree of smokelessness is maintained despite changes in coal characteristics. Total grit and dust emission was 0·19 per cent of the weight of the coal fired, nearly half of which is recovered from a cyclone.

**978. Air Pollution from Waste Water Treatment.** Ledbetter, J. O. (Water Sewage Works, Feb. 1966, **113,** (2), 43–5.) Air pollution from the treatment of waste-waters involves not only the odours and recognized volatiles, but also the aerosol emissions. Significant numbers of bacteria, including pathogens are emitted from activated sludge and trickling filter units. The methods of engineering control available can solve the problem.

**979. Health Hazards of Asbestos.** (Lancet, Mar. 5, 1966, 530–1.) The asbestos industry has become faced with a new type of tumor. Convincing evidence from many countries associates diffuse mesothelial tumours of the pleura and peritoneum with post exposure to asbestos. Investigation of this new hazard is described. Awareness of the dust hazard and rigorous steps to eliminate all heavy or unnecessary exposure are considered essential.

**980. Automotive Emissions and Air Pollution.** Tada, O. (J. Sci. Labour) Rodo Kagaku, Oct. 1965, **41,** 481–92). Because of the increase in the number of motor vehicles in recent years, the problems due to emissions from cars have been attracting attention in large cities. In Japan, the Smoke Abatement Control Act Bill passed the Diet in 1962 and since then some progress has been made in the control of air pollution due to coal combustion. Concerning the implication of automotive emissions to air pollution, more systematic research work is required to obtain the information for appropriate judgment of the present state. At the same time, the effects of long-term exposure to the polluting emissions on human beings and plants should be examined. The author reviewed recent reports of studies on chemical composition, photochemical production, environmental level and the biological effects of automotive emissions.

**981. Removal of Sulphur from Petroleum Products.** Batalina, G. M. and Proskuryakov, J. (Appl. Chem. U.S.S.R., Sept. 1965, **38,** (9), 2030–5). An experimental study was made to determine whether sulphur could be removed from straight-run petroleum fractions by oxidation with atmospheric oxygen in alkali under pressure. The use of elevated pressures was intended to intensify the losses of petroleum products. The investigation was carried out on straight-run fractions of a typical petroleum from the Eastern U.S.S.R. The influence of various factors (temperature, the ratio of the hydrocarbon fraction in the aqueous part, alkali concentration, duration of the experiments, and the nature of the catalyst) on sulphur removal was studied. The flow-rate of air was 2·1/min. kg. The use of a $CuC_21$ catalyst enabled sulphur removal to be carried out at lower temperatures. Removal of sulphur from the fractions boiling below 200° was 100 per cent, for the 200–300 kerosene fraction it was 50 per cent. The physiochemical constants of the fractions were the same before and after oxidation.

**982. Fuel Oil Additives for Controlling Air Contaminant Emissions.** Zinfer, E. Z. (J. Air. Poll. Cont. Ass. Jan. 1967, **17,** No. 1, 43–5.) An addition of additives to fuel oils prior to combustion is one way of reducing combustible contaminant emissions to the outer air. Reported test results show that some additives improve, moderately, the combustive properties of fuel oils. Combustion is also improved but to a lesser degree, in boiler systems that are deficient in operation and design. Being combustible, polynuclear hydrocarbons emissions would be reduced by use of additives. Other types of additives to reduce slagging and inhibit corrosion from combustion of fuel oils are also available. The cost of using additives is low. Improved additives are required especially ones to better combustion in the deficient boiler systems. These can be found by research and literature surveys. Their effectiveness and nontoxicity would be confirmed by laboratory and field testing.

**983. Gaining Public Acceptance for California's Auto Smog Control Programme.** Kovitz, R. (J. Air Poll. Cont. Ass. Jan. 1967, **17,** No. 1, 26–7.) Because of California's unique pioneer programme to control vehicular emissions, many problems of public acceptance arose. It became necessary to educate the average citizen to the causes of smog, why the state programme is necessary, what control systems will do, and why the motorist must be willing to pay for and maintain these systems. Without support, the future of the programme was at one time endangered. But with an all-out effort to reach the public and with federal adoption of the California programme, greater acceptance is being achieved. During the course of the progress of the M.V.P.C.B., in the past five years, all forms of communication media were used. the M.V.C.B. realizes that information creating public acceptance is the life-blood of the programme.

**984. Observations from a Ten-Year-Study of Pollution at a Site in the City of London.** Commins, B. T. and Waller R. E. (Atmospheric Environment, **1,** 1, 49–68.) As part of an extensive study of the effects of air pollution on health, measurements of pollution have been made at a site in the City of London for more than ten years. The results of daily measurements of the concentrations of smoke and sulphur dioxide made throughout that period and of more frequent measurements made during episodes of high pollution are reported in the paper. These show a reduction in the annual mean and peak concentrations of smoke during the ten year period, but there have not been any significant changes in the concentrations of sulphur dioxide. Occasional measurements of a wide range of other pollutants are also reported and results from a series of measurements of polycyclic aromatic hydrocarbons indicate a decline in the concentration of this potentially carcinogenic component of pollution in London.

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## Smokeless Concessions

The Derbyshire Area Council of the N.U.M. decided last week to make another bid to secure a larger cash allowance, in lieu of concessionary coal, for miners living in smokeless zones. Last month the Area council decided to approach the Coal Board at Divisional level. However, the council has now instructed its secretary, Mr. Herbert Parkin, to negotiate with the Board at national level. The N.U.M. contend that the £48 10s. a year allowance for miners in smoke-free areas does not compare favourably with the 9 tons of coal a year allowance which other miners receive. Mr. Parkin said: "Our first request is still in abeyance. We feel strongly about this question and that is why we are pressing the Board for an early decision."—*Colliery Guardian report, 6 Jan. 1967.*

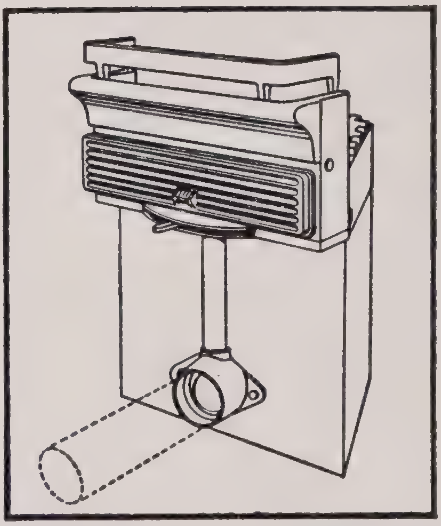
# Cut installation costs in smokeless zones

## with the latest

# LOFIRE

## continuous burning fires with

# underdraught attachment



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...SAVES THIS MONEY: £5

AT LEAST ON EVERY APPLIANCE

ON EVERY HOUSE...

With an average installed cost of £15.10.0, the FANTOM is cheaper than any other domestic appliance designed and guaranteed to burn smokeless fuels.

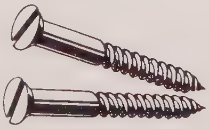
IT LIGHTS QUICKLY

(gas ignition optional), recovers quickly and burns to a fine ash the full range of smokeless fuels, such as Sunbrite, Coalite, Gloco and Rexco.

CENTRAL HEATING TOO

The FANTOM provides 5 hot-water radiators and hot water for new or existing houses to the full Parker Morris standard more cheaply than any other system. Running costs: nil—as long as the fire's alight!

IT IS FIXED WITH...



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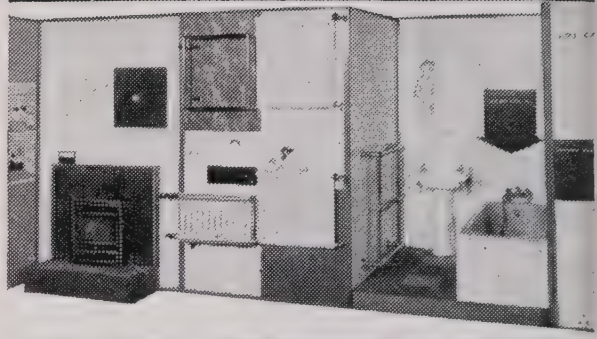
# More ammunition for clean air campaigns

**Local Authorities organising "Clean Air" campaigns, establishing Smoke Control Areas, organising House Improvement or Conversion schemes are invited to take full advantage of the services offered by the Solid Smokeless Fuels Federation, and available free of charge.**



## EXHIBITION

A complete pre-fabricated and self-contained "Clean Air" Exhibition: adaptable in size with one, two, three or four approved smokeless appliances under fire, and displays of the smokeless fuels available in the district.

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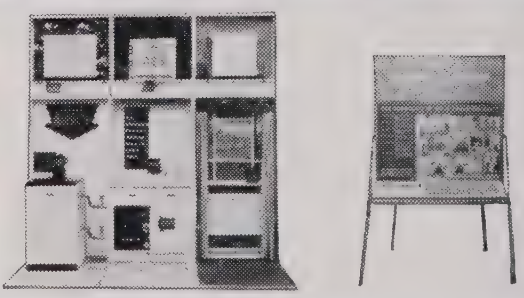
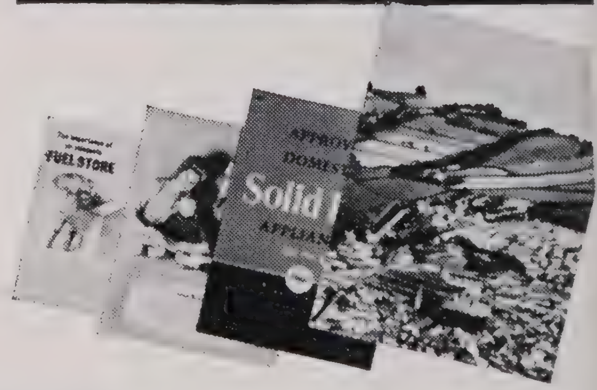
Manned with technical demonstrators, to advise and help residents in proposed or newly-formed Smoke Control Areas. They incorporate approved appliances under fire and a display of the solid smokeless fuels.



## DISPLAYS

A range of portable units variously displaying instructional panels dealing with Clean Air and the Act, a typical central heating unit, fuel displays and literature displays.



## LITERATURE

Informative literature is available free to Local Authorities explaining the Clean Air Act, and giving full information on solid smokeless fuels and the appliances.

*For full details of S.S.F.F. Services and literature apply to:*

**SOLID SMOKELESS FUELS FEDERATION,**
**York House, Empire Way, Wembley, Middlesex**

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# SMOKELESS AIR

JOURNAL OF THE
NATIONAL SOCIETY FOR CLEAN AIR

No. 142 ★ SUMMER 1967 ★ 3s.

*In this Issue*

Address by Reginald Freeson, M.P. ★ Sir John Charrington, President
District Heating Symposium ★ Natural Gas and Clean Air
Air Pollution at R.S.H. Congress ★ New Report on Sulphur Oxides
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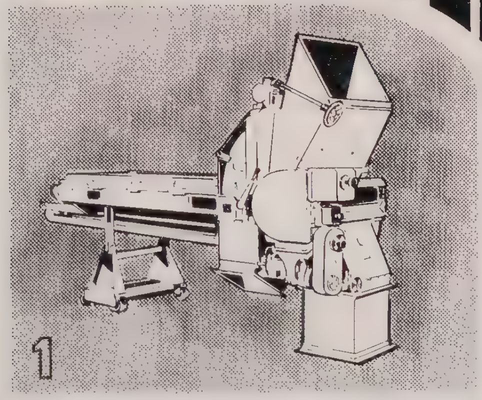

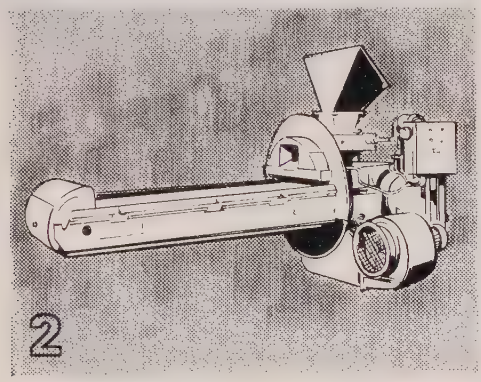

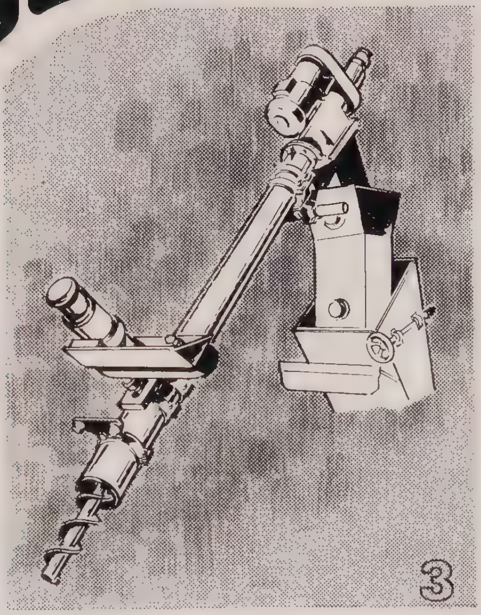

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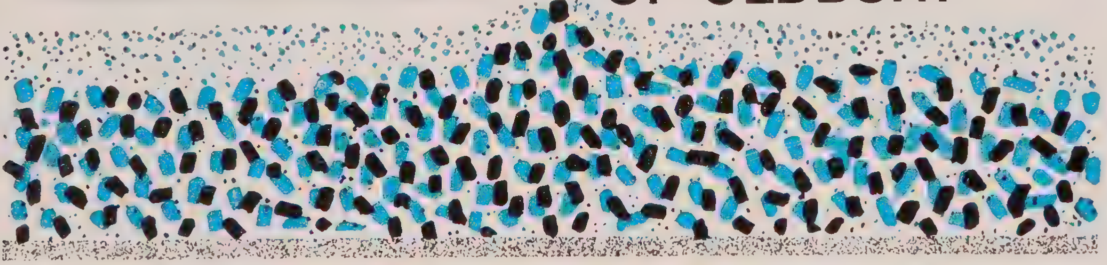

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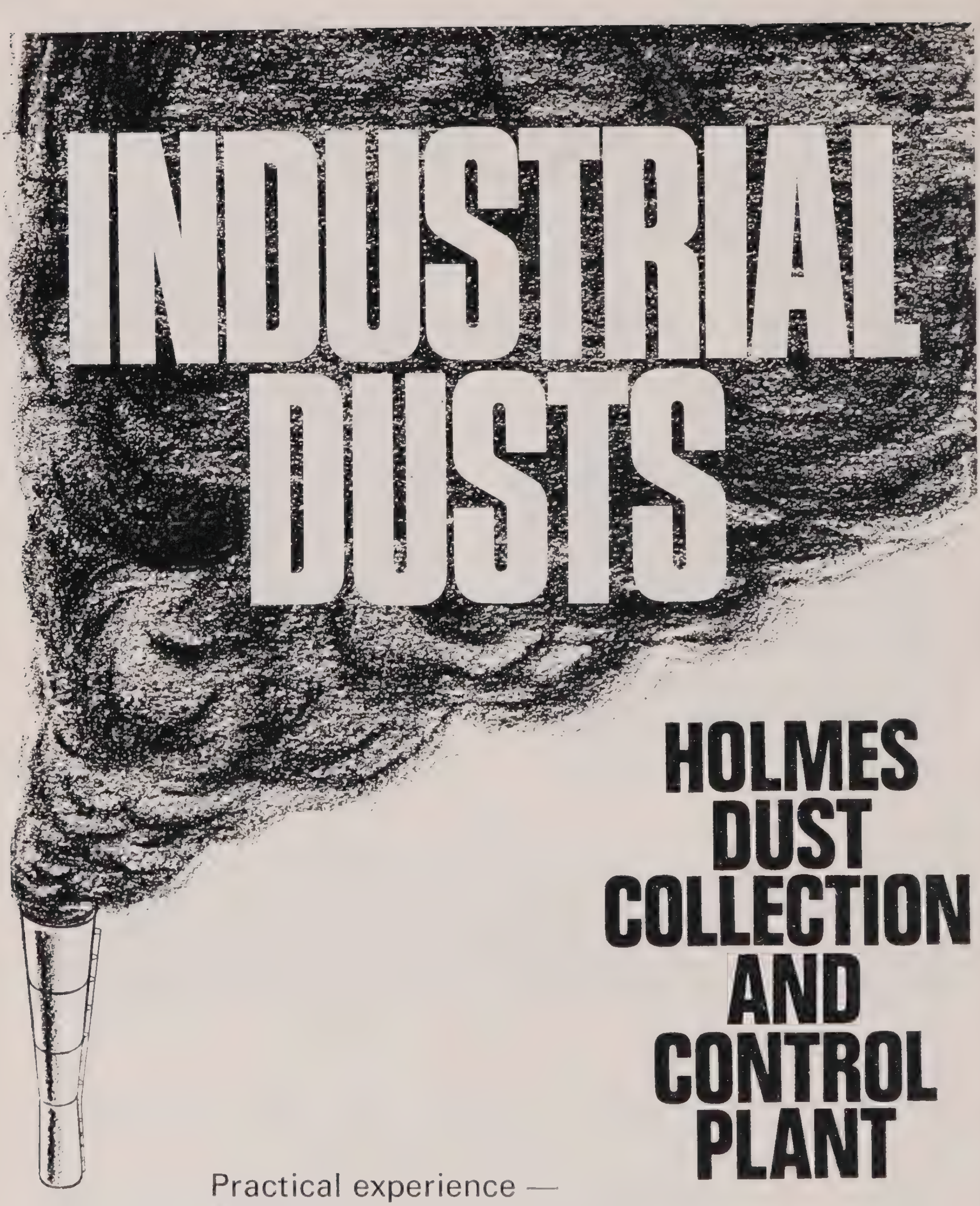

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is the heart-warming answer to the cold facts of the Clean Air Act. Now, no one has to give up a real living fire even in a smokeless zone. The FANTOM has been designed in conjunction with the National Coal Board.

## ...SAVES THIS MONEY: £5

AT LEAST ON EVERY APPLIANCE

ON EVERY HOUSE...

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## IT LIGHTS QUICKLY

(gas ignition optional), recovers quickly and burns to a fine ash the full range of smokeless fuels, such as Sunbrite, Coalite, Gloco and Rexco.

## CENTRAL HEATING TOO

The FANTOM provides 5 hot-water radiators and hot water for new or existing houses to the full Parker Morris standard more cheaply than any other system. Running costs: nil—as long as the fire's alight!

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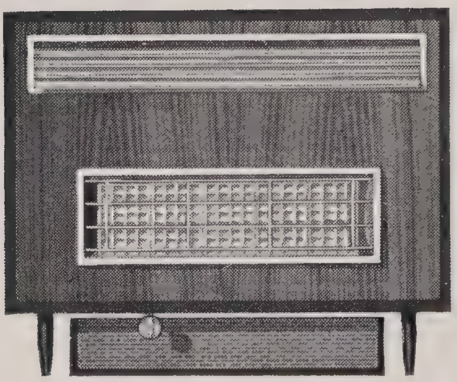

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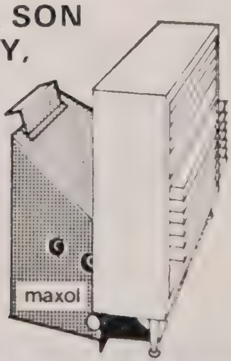

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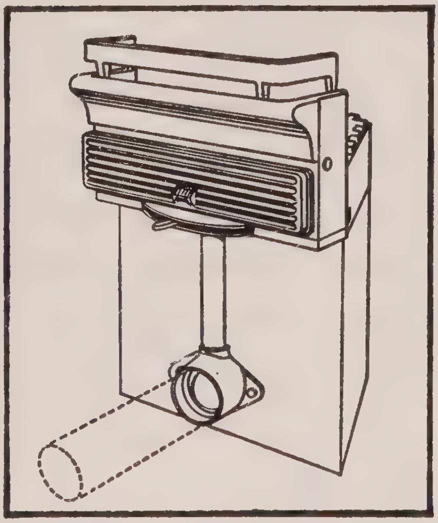

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## NATIONAL SOCIETY FOR CLEAN AIR

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An appointment is shortly to be made for a Director and Secretary, to succeed the present Director and Secretary on his retirement in May, 1968. For a suitably qualified candidate the salary will be on the scale £2,610–£3,240 (including London Weighting). Non-contributory pension scheme. In addition to usual administrative qualifications for such a post, a full understanding of the problems of air pollution will have to be acquired, and ability in writing will be called for, with editorial experience desirable. The successful candidate will be expected to join the Society on or about 1 January, 1968, to work under the present Director until May.

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*Further details will be sent on request. Applications to be received by 1 September, 1967. All communications should be addressed to the Director, National Society for Clean Air, Field House, Breams Buildings, London, E.C.4, marking envelopes "Appointment".*

# National Society for Clean Air

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MEMBERSHIP of the Society is invited and is open to individuals, local authorities, firms and other corporate bodies. Full details and membership application forms will be sent on request.

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# N.S.C.A. INFORMATION

**Blackpool Conference** — *See full programme, page 224*

**International Congress Proceedings Parts I and II** — *See announcement, page 221*

**Appointment** — *See notice, page 208*

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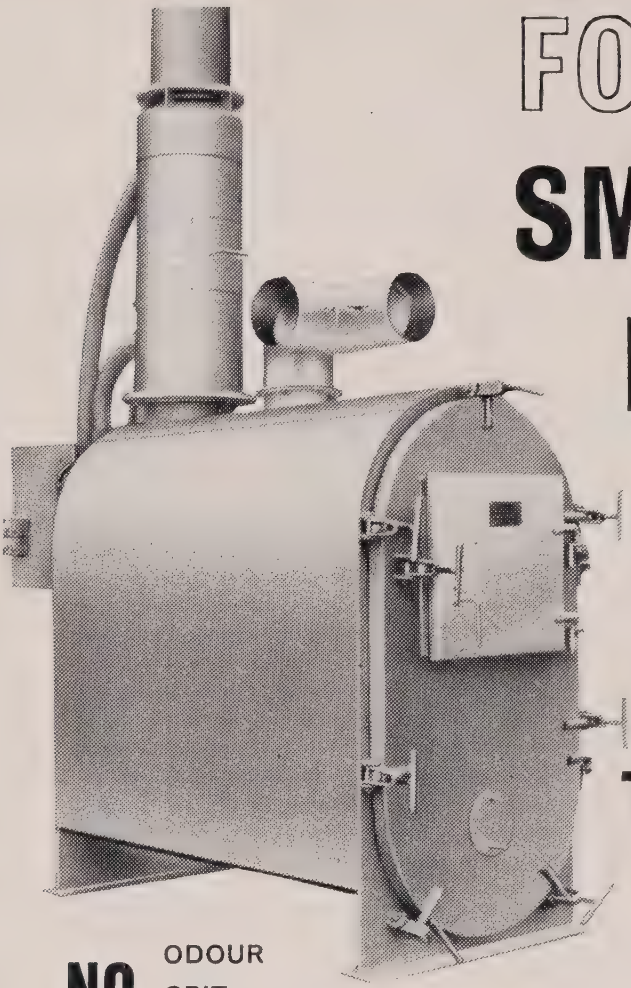

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# SMOKELESS AIR

Vol. XXXVII No. 142 Summer 1967

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: CHAncery 5038 (Editorial and Advertising). Editor: Arnold Marsh; Asst. Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SMOKELESS AIR only, 12s. per annum, post free.

SMOKELESS AIR is the official organ of the Society, but the views expressed in contributed articles are not necessarily endorsed by the Society. Abstraction and quotation of matter are permitted, except where stated, provided that due acknowledgements, including the name and address of the Society, are made.

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*Ships, towers, domes, theatres and temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air.*

# SMOKELESS AIR

## Unauthorized Fuel

A PROBLEM that has given concern to many local authorities in recent years is the evasion of the provisions of section 11 of the Clean Air Act through the use of smoke-producing coal in smoke control areas, made possible by its deliberate sale in these areas. Under the Act the only offence can be that of emitting smoke; it is not illegal to sell coal to be used illegally. Most fuel merchants are reputable people who are careful not to do this, but from the extent of the unease that exists among local authorities there must be a sizeable minority of vendors who ignore their moral responsibility in the matter.

The problem has been discussed by the Ministry with the coal trade, and some time ago the Coal Merchants' Federation agreed to co-operate by taking up the matter with any of their members who were reported to be transgressing. But not every coal dealer is a member of the Federation, and the problem appears to persist and perhaps even to be growing. To get at the facts a question on the situation has been included in a questionnaire the Society has recently sent to local authorities on smokeless heating provisions in new housing.

The action to be taken about such contraventions of the law would appear to be for local authorities to prosecute offending householders as they are entitled to. This is occasionally done, but for some reason or other many authorities seem to fight shy of exercising their powers. There is, of course, the difficulty inherent in a form of control that depends on visual observations, of proving, or even seeing, emissions of smoke during the hours of darkness—at the times, in fact, when they are most likely to occur.

The logical thing to do, obviously, is to prohibit the sale of non-authorized fuel in smoke control areas, except for use in appliances (so far non-domestic) in which it can be burned smokelessly. This would largely eliminate the need to attempt visual observations, and would prevent contraventions at source. There have been hints that legislation on these lines might become necessary, and Mr. Robert Edwards, M.P., in his recent Private Members Bill on air pollution seeks to achieve this. Unless the situation does soon right itself there is no doubt that a better form of control will be sought. It could be by making such sales an offence, with penalties when proved, or by a system of licensing, such as is used in Pittsburgh and other American cities. Fuel vendors are required to take out a licence, to which conditions are attached. One is that coal exceeding a given volatile matter content must not be sold except for use in approved types of appliances. Failure to comply means simply the withdrawal of the licence, and court proceedings and imposition of penalties are not necessary.

## A Moral Question

Glasgow Corporation in a recent

private Bill sought to make it an offence for non-authorized fuels to be sold in smoke control areas. This was not welcomed by the coal trade, and the National Coal Board undertook, as an alternative, to withhold supplies from transgressing merchants. Whether this is working successfully we do not yet know, but it has already drawn a pained protest in the House of Commons, from Mr. Ronald Bell, M.P. (C., Bucks S.), who asked the Prime Minister if he would "see that no member of the Administration uses the monopoly supply position of the Coal Board so as to force people to stop doing what is still perfectly lawful?".

He should have added: ". . . though its consequences are unlawful". The point is whether it is morally right to do something that, although lawful in itself, is done to abet an unlawful act? It is like seeking to halt the technically legal distribution of flick knives or other offensive weapons, or dangerous drugs, that it is known are to be sold for harmful purposes. Wrongs usually exist before a law is passed to prevent them, and the action of the NCB in the matter seems eminently sensible, which if successful could obviate the need for further legislation.

## *A New U.S. Move*

Air pollution developments in the U.S.A. come so thick and fast that we have to use restraint to prevent this journal becoming a transatlantic news agency. The point is that so much of the news is of real interest and importance. Thus we have just received the text of an address by the new director of the National Centre for Air Pollution Control (formerly the Air Pollution Division) of the federal Public Health Service, John T. Middleton.

Speaking to the U.S. Chamber of Commerce in Washington, D.C., Mr. Middleton gave news about a proposed Air Quality Act, sponsored by the President himself. Distinct from the U.S. Clean Air Act of 1963, which is mainly concerned with the promotion and financing of research, education, etc., the proposed new Act will set out to prescribe emission standards for the industries that contribute substantially to air pollution. At present there is what Mr. Middleton called a patchwork pattern of control, varying from state to state, and from city to city, giving industries on one side of a boundary line control requirements differing from their competitors on the other side of the line. The Act would also enable Regional Air Quality Commissions to be set up in areas where pollution from one State is harmful to the inhabitants of a neighbouring State. Mr. Middleton pointed out that this would not diminish the role that state and local government play in the control of air pollution, but that it would in fact make their roles "more meaningful and more useful than they ever have been in the past".

It is interesting to see how the U.S. is overcoming the problem of effective air pollution control, on the national basis that is required (and which we in the U.K. enjoy) without infringing the jealously guarded rights and privileges of the states and local authorities. Such developments are an exercise in diplomacy and care that is unknown to us in this country.

One intriguing point about the proposed Act is the term "Air Quality". It is new to us (and, we think, comparatively new to the Americans) and at first sight seems a little odd. It appears to mean pollution standards, or pollution levels, on which the quality of the air depends. If in this

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* As we were going to press, Dr. W. A. Horne, until recently MOH for Glasgow, speaking at the Scottish Division Conference at Ayr, stated that since November 1966, 49 merchants had been found selling coal in smoke control areas in the city, some for the second, third, or even fourth time. 36 shops had also been reported for selling prepacked coal. Dr. Horne said: "It is quite clear that the coal trade cannot or will not put its house in order." Mr. John Foreman said this was also occurring in Dundee, "even among so-called reputable merchants".

# Sir John Charrington, President

*At the Annual General Meeting of the Society on 2 May, 1967, the election was announced of Sir John Charrington as President, in succession to Sir Alan Wilson. Sir Alan invested Sir John with the chain and badge of office during the luncheon that followed.*

*Sir John needs no introduction to most readers of this journal. He was Chairman of Charrington, Gardner, Locket and Co. Ltd., for many years, and on his retirement from that post in 1964—after a period of great expansion for the company—he was appointed President for life. He has been Chairman of the Chamber of Coal Traders and of the Coal Merchants' Federation. Today, although "retired," Sir John is Chairman of the National Federation of Coke Distributors' Associations, a Vice-President of the Coal Utilization Council and of the British Coal Utilization Research Association, and is a member of the Clean Air Council.*

*Sir John has valiantly championed the cause of clean air in less enthusiastic circles, and has done much to bring about an understanding that a positive acceptance of clean air policy is in the best long-term interests of solid fuel. It was felt that to invite Sir John to be President was one small way of paying tribute to him for his distinguished services for clean air, and it is an honour to the Society that he should have consented.*

country we ever decide to get rid of the obsolete and misleading title of the Alkali &c. Works Regulation Act, we might do worse than re-name it the Air Quality Regulation Act. As it is, the most important part of the name is the unobtrusive "&c.".

## Storm in a Teacup

Storm in a coalscuttle might be a better heading. We refer to the remarkable consternation expressed in leading articles in *Colliery Guardian* and *Coal*

*Merchant and Shipper* about a phrase in the notice of a meeting sent out by the South East Division of the NSCA. This announced an address by a non-member speaker on smoke prevention in new housing, and quoted his own question: "Should all new housing estates be smokeless and preferably all-electric from the start?" This was regrettably misread as implying that the Society itself was moving to an all-electric policy, jettisoning its traditional neutrality towards all methods that are smokeless. The two journals were really wrathful and perturbed about this, and said so at considerable length.

The South East Division has assured them that the Society is not changing its policy, and we reiterate this. We have always believed, and will continue to do so, that clean air progress needs all the smokeless methods that are available, and moreover that clean air requirements will be accepted by the public all the more readily if there are plenty of alternatives to raw coal to choose from.

# The Executive Council and Officers

At the annual general meeting on 2 May the election was announced of Sir John Charrington as President, and the re-election of Stanley E. Cohen, C.B.E., as Hon. Treasurer. The election results for divisional representatives to the Executive Council were also announced. New members are J. Mann (Senior Public Health Inspector, Chadderton) in the North West Division, and Councillor A. Mead (Kirkby-in-Ashfield) in the East Midlands Division. New members appointed by National Bodies in membership are A. J. Clarke (Central Electricity Generating Board) and G. W. Moule (South of Scotland Electricity Board).

At the first meeting of the new Executive Council held in the afternoon of 2 May, A. C. Saword (Chief Public Health Inspector, Kingston-upon-Hull) was elected as Chairman in succession to James Goodfellow, whose term of office had expired. Dr. W. C. Turner was re-elected as a Deputy Chairman, and Stanley Cayton elected as a new Deputy Chairman.

The meeting expressed its grateful thanks and appreciation to Mr. Goodfellow for his services as Chairman. The meeting also expressed its gratitude to Albert Wade, M.B.E., on his retirement from the Executive Council and his forthcoming retirement from the Honorary Secretaryship of the East Midlands Division—a post he has held since the Division was set up in 1949.

## AMERICAN HONOUR FOR NSCA DIRECTOR

Arnold Marsh, O.B.E., the Society's Director, and editor of this journal, has been elected by a ballot of the Council of the Air Pollution Control Association of America, to receive their Richard Beatty Mellon Award for 1967. This annual award is made "to a prominent person whose contributions of a civic, administrative, technical or other nature have aided substantially the cause of air pollution control" over a period of years.

This is the first occasion that the Mellon Award has been made to anyone outside North America. Mr. Marsh, and his wife, have been invited to be the guests of the Association at their annual conference in Cleveland, Ohio, in June, when the award will be made during the course of the President's luncheon.

### Voice of the North ?

*Buildings like the local churches, mills and houses became black by determination and hard work. Time-encrusted grime is part of us all in the north of England and should stay with us, not be shamefully sandblasted away.* —*Letter in* Rochdale Observer.

# *Address to the Society*

### by

## Reginald Freeson, M.P.

*Parliamentary Secretary, Ministry of Power*

**An open meeting of the Society was held immediately after the Annual General Meeting on 2 May, 1967, at which Mr. Freeson gave the following address. He was also principal guest at the annual luncheon that followed.**

IT is about fifteen years, I believe, since the great smog of London, which I am sure all of us remember; and coincidentally it is fifteen years also that arising from that great smog I made my first speech in public on air pollution and my last one until today. You were then the National Smoke Abatement Society, if I recall correctly. It was not that I had not been interested before in air pollution and certainly it has not been because I have not been interested since. At that time I had recently been catapulted by accident into my local authority, winning a seat which had been unexpected—you can see what has happened to me since—and I was already beginning to get active in my own area, rather a difficult one in North West London, laying plans as to how we could go about doing what Manchester and one or two other authorities had started to do before the Clean Air Act came in, in 1956. Fortunately we were able to drop our original plans and proceed under the Act and we are, I suppose, in my own area as progressive as any other of the more progressive authorities in this field, in gradually extending clean air zones in the borough. It is fair to say, however, and I think this would be true of most other authorities too, that we started in the easiest areas first. However, it is a long time since then, and much has happened, and I will come back to the issue of clean air during the course of my remarks.

I would like, as the Junior Minister of the Ministry of Power, to speak of the background with which we are mostly concerned: our fuel policy; and then to lead on to some other observations. It is only about two years since the then Minister of Power came to your annual lunch to tell you that fuel policy was under review and here am I coming to tell you that it is under review again. This would be understandable if you thought we deliberately arranged things thus so as to avoid giving you solid facts about policy. This is not true of course, for hardly had we got our fuel policy review under way or completed and published by way of a White Paper some two years ago, than there were discoveries of great supplies, great potential supplies, of natural gas in the North Sea. At the same time we went into a phase where mining manpower was dropping drastically at an accelerating rate. The White Paper had indicated, when it was published in 1965, that there would have to be continual review of policy as new information came to light and as the pattern of fuel consumption and the projected demand changed with a changing economy and this of course had to be modified almost immediately because of the major changes which were implied by the discovery of natural gas.

So today we are studying, evaluating, and analysing a tremendous amount of information that we as a Ministry have been collating on all sides on fuel consumption over the past months, and I would like to give you some idea of how we are approaching the present review. The over-riding objective of fuel policy is for the energy industries to be fully directed to strengthening the economy and the balance of payments, which as a general observation nobody would challenge. More specifically we are concerned with the adequacy and the security of supply, costs and prices, finance and technology of the fuel industries, foreign exchange costs and consumer choice. Quite a range when one begins to think of what is implied by those headings in any review of fuel policy! It is not a question just of any one of those headings but a whole complex of them coming together. The objectives do not change, but the means to achieve them have to be studied and re-studied as time goes on to make sure the objectives are effectively sought after. We cannot have the best of any one of the worlds, as it were, that were implied in those headings. For example, cheapness in fuel supplies does not always go hand in hand with clean air, and I do not have to elaborate on that point here, that is just one example, but the important thing is that a balance has to be found between what can sometimes be conflicting interests. And as circumstances change so that balance of advantage has to be looked at again.

### A Four Fuel Economy

Up to now in this country we have relied basically on two primary sources of energy, coal and oil. We now know that there are substantial reserves of gas under the North Sea, though we shall not know the full extent of these reserves for some years. Recent studies have also confirmed the earlier promise of competitive nuclear power in the early 1970's. Both these new sources will make a growing contribution over the years to come but they will not replace the other two, they will complement them in a growing economy. We are moving from a two-fuel economy to a four-fuel economy in which coal, oil, natural gas and nuclear power each has a substantial part to play. What role each will play is the big question; the discoveries of natural gas so far made, the promise of competitive nuclear power and technical and economic developments affecting all the fuel industries, make the eventual pattern of fuel consumption somewhat uncertain. To cater for this uncertainty we are examining a wide range of assumptions and assessing the probability and consequences of several possible outcomes including the different implications for costs and prices, for manpower and capital requirements, for the balance of payments and so on. We shall need to exercise very careful judgment in taking decisions. We shall need to keep as much flexibility as possible, to be able to meet further changes which we cannot foresee now, any more than we could foresee, two years ago, how far we would discover commercial reserves of natural gas. Indeed this flexibility is essential if we are to develop sensitive planning methods. There is a very great deal at stake in this vital sector of the economy and its effects on the economy as a whole, and we cannot afford to be wrong. Therefore we are taking very great care in this study.

### Smoke Control Progress

I would like to tell you now about some of the progress as we see it which has been made in smoke control, set against the kind of general background of the fuel policy review I have indicated. In 1966 the number of non-industrial premises in the black areas covered by smoke control orders was over 400,000 during the year. This was an increase of over 25 per cent. In the previous two or three years the average was only 320,000. The total number of premises in the black areas in England and Wales subject to smoke control passed the 3 million mark during the first quarter of this year. This is very encouraging, particularly when one realizes that much of 1966 was overshadowed by economic difficulties, and local authorities, as you will know, had to review their expenditure and priorities at the request of the Ministry of Housing and Local

Government. It certainly seems that they have taken note of the close association of clean air with public health and to prefer to look for economies elsewhere, and from my own personal knowledge I can confirm this. I personally know of boroughs where not just this year but on previous occasions when they have had to undertake reviews of expenditure that they have set their minds right from the start against any interference with the smoke control zone programme which they may have initiated or had initiated in earlier years.

Another encouraging thing about the figures is that some of the increase arises from the response of authorities to whom the Ministry of Housing and Local Government wrote early last year because they had made little or no progress in smoke control. Out of the 82 authorities to whom these letters were sent by that Ministry, 34 have now submitted smoke control orders and many of the others are known to be considering the making of orders. I do not wish to gloss over the fact that this still leaves a number of authorities doing nothing, but the size of the response is encouraging and shows that an appeal of this kind to the sense of responsibility and concern for public health in the matter of clean air, will not go unheeded.

One other heartening sign of progress is that in Greater London about 60 per cent of the premises have been covered by smoke control orders up-to-date. At this point the time is coming when we shall have to think what the next stage in the campaign for clean air is to be. Things have not stood still since the Act was passed over a decade ago. If we were to draw the boundaries of the black areas today for the first time, it is doubtful whether we would draw them in the same place as they were drawn then and I know that the Ministry of Housing and Local Government have started work on the job of re-drawing these boundaries. They hope to establish a criteria for deciding where they should go which will give a more realistic framework for present policy and also for future policy to be developed.

*Reginald Freeson, M.P.*
*Parliamentary Secretary, Ministry of Power*

There has been of course a new development which will be of help to local authorities in the industry itself. Until now some areas at least have received at times confusing advice from local suppliers about the supply of various kinds of solid smokeless fuels, but as from next month there will be improvements in local arrangements initiated by the Solid Smokeless Fuels Federation. Machinery has been set up under which in each of eight regions in England and Wales, one representative will answer for all producers and distributors. A local authority will need to make inquiries of only one person to get information on the suppliers of smokeless fuels in the area concerned and certainly this is the kind of simplification of procedure which is to be commended from the point of view of the campaign for clean air. It is sometimes suggested that the progress of clean air is hindered by doubts about the adequacy of smokeless fuels but while I appreciate, because I have heard some of these queries and complaints first-hand myself before I came to the Ministry of Power, one should nevertheless look at the facts and not be entirely emotive when making complaints or queries. In 1960 34 million tons of house coal was consumed in this country but by 1966 the figure had fallen to less than 25 million tons. This sharp drop of 9 million in six years includes a million tons in miners' coal. In the six year period total domestic fuel consumption however, in terms of coal equivalence, rose from 74 to 87 million tons but the consumption of all the solid smokeless fuels taken together only rose from 6.2 to 8.1 million, slightly less than 2 million tons increase. The consumption of gas and electricity taken together rose by the equivalence of 21 million tons, well over 50 per cent in that period of time. In other words the gas and electricity industries are providing the bulk of the increasing demand for fuel in the domestic market.

These are some of the kind of facts of course which have a very close bearing on the fuel policy review to which I referred to earlier, and the trends they reflect. These changes reflect the work done by not only industry itself but by the National Society for Clean Air, the various housing and planning authorities, developers, nationalized fuel industries, oil firms, appliance manufacturers, designers and technicians. They are a whole range of people who have been concerned with trying to raise standards, but at no time should we forget the pioneering work, and at no time do I forget, that it was done by what was then the National Smoke Abatement Society which became eventually named the National Society for Clean Air. All, however, over these years, particularly since the passing of the Act, have contributed towards achieving the housewives' and their husbands' desire for cleaner, labour saving homes, and the increasing demand for higher standards of domestic heating: a demand which is still continuing and which shows little if any sign of abating, notwithstanding the economic difficulties which the country is having to face. People, particularly younger people have been increasingly desiring higher standards of comfort and convenience in their homes, and this together with the building of new houses and flats will maintain this trend. One of the interesting things for us to see in the future will be the extent to which, in a situation of choice in an expanding economy, the emphasis in consumption may shift from, shall we say buying motor cars, to increasing the comforts and standards of home life. There are certain indications that this is going on in other advanced industrial countries such as the United States and we may well see these kind of trends showing themselves in this country. There is recent evidence of this which lies in the increasing sales of partial and complete central heating in homes in all its forms whether it be solid fuel or gas fire room heaters or electric storage heaters.

A little off-beat from the main theme of these remarks but of interest to you and of course related to the whole question of trying to raise the home and environmental conditions under which something approaching 80 per cent of the population live in cities and towns, is the growing interest once again in electric cars that has been in the news quite a lot recently. There, successful development will be of much importance, if it comes off, in contributing to clean air in our cities, and I think it is right to commend the initiative taken by our own Electricity Council representing the nationalized electricity industry in introducing certain prototypes for the use of some of its staff for experiments to test their value and how they operate. They have extended this by inviting tenders for the supply of three different types of electric vehicles for their staff to use in day-to-day business, and I believe that the deliveries of the first run of the pre-production model, the Scamp, are expected soon.

But to return to the main background theme. I would like to speak of natural gas. Everybody speaks of natural gas these days and rightly so because this, certainly in the context of this meeting, is an ideal smokeless fuel and should, in coming years make an important contribution to clean air. The North Sea could supply at least 2,000 million cubic feet of gas a day by 1970 or soon after, and the significance of this figure is realized when one points out that this is double the quantity of total town gas supplies at present being consumed in this country. By the 1970's the supply of natural gas from the North Sea will be equivalent to something like 10 per cent of our total energy requirements at that stage. The gas discovered so far is virtually sulphur free. If in the future it was found to contain some sulphur it will be purified before being distributed by our area Gas Boards. We can therefore be certain that the increasing use of natural gas in industrial and domestic markets will play an important part in reducing air pollution.

I, as you will have gathered, am particularly glad that we are able to contribute so fully from our side of government and the economy to the objectives of your organization. It must be borne always in mind that the fuel industries do not exist as ends in themselves; they are by their very nature servicing other overall economic and social objectives, and clean and attractive cities and industry is one of the most worthwhile of these objectives. It is for this reason that I am glad to be able to come for the first time to speak to your Society, although I do assure you that I have had a personal interest in the activities in your work over a good many years. Thank you for inviting me.

**LONDON**
**INTERNATIONAL CLEAN AIR CONGRESS**
**1966**

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# AIR POLLUTION BILL

## *Second Reading Given to Robert Edwards, M.P., Bill*

In the House of Commons on 5 May, 1967, an unopposed second reading was given to the Bill on air pollution introduced by Robert Edwards, supported by Frank Allaum, Will Owen, Geoffrey Rhodes, Tom Bradley, Hugh Delargy, John Horner, Peter Archer, and Jack Ashley. The Bill has four main clauses, dealing with motor vehicle pollution, the sale of non-smokeless coal in smoke control areas, the emission of dark smoke from industrial premises other than from a chimney, and the Clean Air Council.

### Motor Vehicle Emissions

Clause 1 reads as follows:

**1.** Regulation 80 of the Motor Vehicles (Construction and Use) Regulations 1963 shall be amended by the insertion after the word "danger" of the words "or constitute a nuisance", and accordingly—

> "No person shall use or cause or permit to be used on a road any motor vehicle from which any smoke, visible vapour, grit, sparks, ashes, cinders, or oily substance is emitted if the emission thereof causes or is likely to cause damage to any property or injury to any person who is actually at the time or who reasonably may be expected on the road, or is likely to cause danger or constitute a nuisance to any such person as aforesaid."

### Sale of Unauthorized Fuel

This clause relates directly to the problem that is discussed more generally in the editorial on page 213. It is the part of the Bill that may be expected to cause most controversy. It reads:

**2.**—(1) In any smoke control area established under the provisions of section 11 of the Clean Air Act 1956, or in any smokeless zone established under the provisions of a private Act, it shall be an offence for any person to buy, sell or deliver any solid fuel other than a fuel authorized in the Smoke Control Areas (Authorized Fuels) Regulations 1956.

Provided that in any proceedings for an offence under this section it shall be a defence to prove that the fuel was bought, delivered or sold for use solely in a fireplace in a building exempted from the provisions of secion 11 of the Clean Air Act 1956 by virtue of paragraph (*c*) of subsection 3 or subsection 4 of that section.

(2) A person guilty of an offence under this section shall be liable on summary conviction to a fine not exceeding ten pounds, or in the case of a second or subsequent offence to a fine not exceeding twenty-five pounds.

### Dark Smoke

Clause 3 follows the wording already included in two local Acts—the Middlesex and the West Riding of Yorkshire—and should therefore be acceptable as it stands. Its purpose is to make possible a better control of smoke emission other than that emitted from chimneys. The Clean Air Act deals with this only in section 16, which it is difficult to enforce because it requires proof that there is a nuisance to the inhabitants of the neighbourhood. It is intended in particular to deal with pollution caused by the burning of industrial wastes. Although we have published the existing provisions previously, it may be useful for the record to print them again as they appear in Mr. Edward's Bill:

**3.**—(1) As from the appointed day, dark smoke shall not be emitted from any industrial premises, and if on any day dark smoke is so emitted the occupier of the premises shall be guilty of an offence and shall be liable to a fine not exceeding one hundred pounds.

(2) This section shall not apply to—

- (*a*) dark smoke emitted from a chimney of any building or from a chimney to which section 1 of the Clean Air Act 1956 applies by virtue of subsection (4) of that section;
- (*b*) dark smoke accidentally or inadvertently emitted if all practi-

cal steps have been taken to prevent or minimize the emission of such smoke; and

(*c*) premises controlled under the Alkali, etc., Works Regulation Act 1906.

(3) In this section—

"appointed day" means such day as the Minister of Housing and Local Government may, by order, appoint;

"chimney" has the same meaning as in subsection (1) of section 34 of the Clean Air Act 1956;

"dark smoke" has the same meaning as in subsection (2) of section 34 of the Clean Air Act 1956;

"industrial premises" means premises used or designed for use for, or held in connection with, the carrying on of any process for, or incidental to, any of the following purposes, namely—

(*a*) the making of any article or part of any article; or

(*b*) the altering, repairing, ornamenting, finishing, cleaning, washing, packing, sorting or canning or adapting for sale or breaking up or demolition of any article; or

(*c*) without prejudice to the foregoing paragraphs, the getting, dressing, or preparation for sale of minerals or the extraction or preparation for sale of oil or brine;

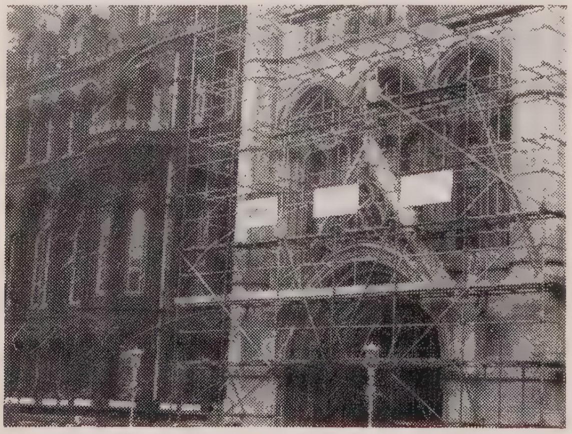
being a process carried on in the course of trade or business; and for the purpose of this definition "article" means an article of any description including a ship or vessel.

### Clean Air Council

Clause 4 of the Bill seeks to remedy what many people think to have been an omission of importance from the Clean Air Act—namely, that the Clean Air Council should each year publish a report of activities and progress. It reads:

**4.** The Clean Air Council constituted under section 23 of the Clean Air Act 1956 shall as soon as possible after the end of each calendar year make to the Minister a report on their activities, and the Minister shall lay a copy of every such report before each House of Parliament. (Reports of Clean Air Council. 1956 c. 52.)

At the time of going to press it is not known when the Bill will be able to proceed to its committee stage, when serious consideration of its provisions will be given, and the attitude of the Government to its provisions in detail made known.



*Manchester Town Hall, jet black for many decades, and sometimes alleged to be built of coal, is now being cleaned. Two photographs taken during a recent visit, as the pleasant creamy colour of the stone begins to be revealed*

# BLACKPOOL CONFERENCE

## *The Complete Programme*

The sessional programme for the conference has now been completed and is as follows:

**Tuesday, 17 October**

*Morning:* Civic Welcome by the Mayor of Blackpool; opening of the conference, and address, by the Joint Parliamentary Secretary, Ministry of Transport, Stephen Swingler, M.P.; Presidential Address, by Sir John Charrington.

*Afternoon:* Discussion on the report of the Society's Technical Committee on Air Pollution from Road Vehicles, to be opened by the chairman of the committee, Dr. Albert Parker; Paper on "Some Specific Air Pollution Problems" by Drs. Bonnell and Lawther.

**Wednesday, 18 October**

*Morning:* Paper on "Clean air and the North West Environment", by U. Aylmer Coates, County Planning Officer, Lancashire County Council; Paper on "Some Mineralogical Aspects of Air Pollution Damage to Stone", by K. J. Henley (Warren Spring Laboratory); Paper on "Corrosion by Air Pollution", by J. R. Goss (Warren Spring Laboratory).

*Afternoon:* Visits.

**Thursday, 19 October**

*Morning:* Des Voeux Memorial Lecture, "Clean Air and the Future Energy Pattern in Britain", by F. E. Schumacher; Paper on the Dust and Grit Working Party Report, by Donald Hicks (Chairman of the Working Party).

*Afternoon:* Domestic Heating: Paper on "The Cost of Smoke Control", by A. R. Smith (Author of the S.C.I. Monograph "Air Pollution"); Discussion on NSCA Inquiry into Smokelessness in New Towns and Housing Developments.

**Friday, 20 October**

*Morning:* Paper on "Municipal and Industrial Incineration", by E. J. Ostle (NIFES); Paper on the F.O.S. (Fuel-Oxygen-Scrap) fumeless steelmaking process, by T. D. Spenceley (BISRA).

The papers will of course be printed and distributed in advance to all registered delegates, with the exception of the Presidential Address and the Des Voeux Memorial Lecture, which will be available in printed form after presentation.

**Social Events**

Social events to be noted include the traditional informal "get together" on the Monday evening; a Civic Reception, with dancing, on the Wednesday evening; and a conference dinner (in place of a luncheon) on the Thursday evening.

**Visits**

Some interesting technical visits are being arranged for the afternoon of Wednesday. They include an afternoon visit to the new and outstanding Civic Centre at Blackburn; a day visit to the Parkside Colliery, including the N.C.B. Anderton House Computer Centre; a day visit to the Pilkington Glass Works (and museum) at St. Helens, and an afternoon visit to Leyland Motors. Full details and booking forms will be sent to all delegates in due course.

There will also be social occasions for the ladies, including a cookery and fashion show at the showrooms of the North West Gas Board, Blackpool; and a visit to Kendal (North West Electricity Board).

Finally, enthusiasts should note that the annual golf tournament is being arranged and will take place on the Royal Lytham St. Annes course. Details on request.

# INTERNATIONAL SECTION

## NEW REPORT ON SULPHUR OXIDES

*U.S.A.*

**Air Quality Criteria for Sulphur Oxides. U.S. Department of Health, Education and Welfare, Air Pollution Centre, Washington, D.C.**

This is a report of 234 pages, stemming from the U.S. Clean Air Act, 1963, which gave DHEW authority to publish air quality criteria as guides for air pollution control authorities. To quote: "these criteria establish the levels of concentration at which individual pollutants begin to harm our health and foul our environment. They set the levels we must aim for in our drive for clean, breathable air".

This examination of the sulphur oxides is the first of a series, and is a thorough examination and analysis of the effects of the sulphur oxides (mainly, of course sulphur dioxide, $SO_2$), based on wide-ranging sources of information—the list of references runs to 347 items. The physical and chemical properties of the sulphur oxides are first examined, followed by consideration of atmospheric reactions, sources, measures, concentrations and their variations in the air. Then follow two full and important sections on the effects, first on visibility, materials and vegetation, and then on the health of man and animals. Both laboratory and field tests, and clinical-epidemological studies are drawn upon.

One of the most interesting features is a lengthy table of 79 cases, showing observed effects of the pollutants on health at progressively increasing concentrations. These have been plotted on the chart we reproduce opposite. The figures relate to items in the table. That marked 31, for example, relates to the London smog of 1952.

Following discussion on this assembled data, the conclusion is reached that in order to prevent health effects the concentrations, and exposure times, must be less than the cross-hatched area in the central part of the diagram, but, it is pointed out, it is not possible to determine from existing data how much lower exposures need to be. The report continues:

Since the following concentrations are expected in urban communities with diffuse sources having an annual average concentration of 0·015 ppm sulphur dioxide these sets of ranges of concentration can be collectively utilized as criteria of acceptable air quality:

| *Time Period Average* | *Maximum* | *1 Percentile* |
|---|---|---|
| 24-hour | 0·05-0·08 | 0·04-0·06 |
| 1-hour | 0·12-0·20 | 0·05-0·11 |
| 5-minute | 0·10-0·50 | 0·05-0·14 |

In the table referred to above a column is given for other pollutants present, and although other references are made to the effects of combinations of pollutants, insufficient attention is drawn to the importance of this. Air pollution as it is experienced generally is a multi-pollutant problem, and the study of any one pollutant in isolation can create misleading impressions unless the existence of the over-riding complex is clearly indicated.

There is also a chart, similar in nature and purpose to the one we reproduce, showing the effects of sulphur oxides on pollution. This aspect is fully discussed, as are the effects on materials and the question of atmospheric visibility. It is sensibly concluded: "if sulphur oxides are reduced to levels that will protect health, the effects of vegetation will be

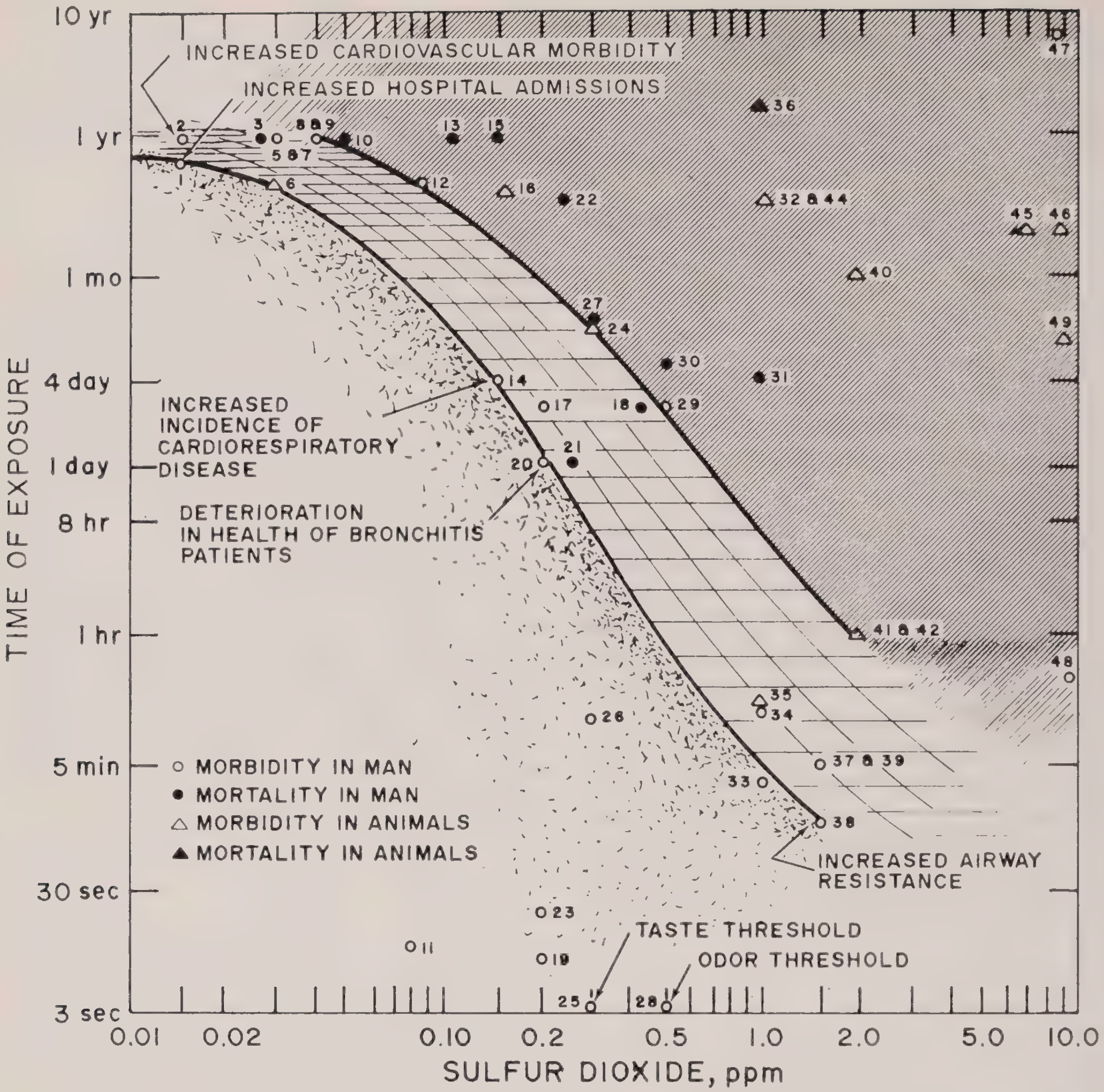


Figure I. Effects of sulfur oxides pollution on health.

Numbers refer to items in column I Table I

▨ Range of concentrations and exposure times in which deaths have been reported in excess of normal expectation.

▦ Range of concentrations and exposure times in which significant health effects have been reported.

░ Ranges of concentrations and exposure times in which health effects are suspected.

**Diagram from "Air Quality Criteria for Sulphur Oxides"—see text**

eliminated, visibility will be appreciably improved, and damage to materials will be markedly reduced".

For such a comprehensive and carefully documented publication—which will be a most helpful source of data and references to many workers and writers—an index would have been valuable. And it would have been excellent if the new international unit of concentration, microgrammes per cubic metre, could have replaced the parts per million unit in which most of the figures are expressed.

## OTHER U.S. NEWS IN BRIEF

### State Legislation

The Council of State Governments (1313 East 60th St., Chicago, Ill., 60637) has reprinted as a booklet from its periodical *Suggested State Legislation* a model "State Air Pollution Control Act". It gives in full the wording for a complete Act, with alternatives for certain sections.

### Objections

It is reported that Government rules on industrial air pollution, first drawn up last year by DHEW, are being delayed by strong objections from a number of oil refiners and coal-mine operators. The problem involves the amount of sulphur dioxide released during the refining of crude oil and the burning of coal at electricity generating stations.

If the standards are too stiff, it is said, they could close a number of mines now supplying low-grade coal with a high sulphur content, and in the case of the refineries the problem is heightened by the current shortage of low-sulphur crude petroleum.

### Sulphur in Oil

According to another report, deep concern is being felt by some officials in the State Department over the accelerating switch in residual oil supplies from the Caribbean, for import to the East coast, to other foreign sources, because of the high sulphur content of Venezuelan residual. New York City is demanding fuel with less than 1 per cent sulphur content—oil and coal—"as soon as possible". The Federal government is leaning towards standards that would be twice as severe—0·5 per cent sulphur.

### Washington Air

Though lacking any substantial industries, Washington now has an atmosphere dirtier than that of smog-ridden Los Angeles, a Government health expert told a Senate subcommittee on air pollution. The capital now ranked fourth in air pollution after New York, Chicago and Detroit.

### Manganese Additive

The addition of a manganese compound to fuel oil will reduce air pollution by about one-half, claims the Ethyl Corporation of 100, Park Avenue, New York City. Cost of treatment—one gallon of additive to 35,000 gallons of fuel oil—is about sixpence per 100 gallons.

Ethyl says the manganese reduced sulphur trioxide emission by 45 per cent at one power plant. It also reduced soot deposits so tubes had to be blown out only every three or four days instead of twice a day. The additive is promising for gas turbine generators, the company adds, and might even be used in oil burned in home central heating.

### Colour Bar for Cars

Only half the cars in Philadelphia will be allowed on the roads during smog alerts, if a proposal by the Pollution Control Board is adopted.

Under the scheme all cars will get either a blue tag or a red tag.

If the air pollution level moves up towards danger point, blues and reds will be allowed to drive only on alternate days.

### Stiffer Car Exhaust Controls

Automobiles, "America's symbol of galloping affluence", says *Science News-Letter*, annually befoul the air with an estimated 95 million tons of assorted noxious exhaust products. Despite the new Federal control measures total emissions are expected to double by the year 2000.

Stiffer exhaust standards are to be proposed for 1970 model cars. According to Secretary for Health, Education and Welfare, John W. Gardner, every year about 1,000 million gallons of petrol are lost to atmosphere through evaporation from fuel tanks and carburettors. The latter loss occurs when the heat from a stopped engine evaporates petrol left in the carburettor.

On the average trip, most cars now lose about 10 grams of petrol in this way and about 30 grams from the petrol tank. The proposed standards would limit this to 2 grams per trip. The use of devices recently developed to cut these losses could save 900 million gallons of petrol a year.

### Pollution may Kill Off Mankind

E. A. Schuck is reported to have said that instead of creating a future of scientifically advanced human civilization, man may render himself extinct, not by waging nuclear war but by neglecting nuclear energy. If man wants to go on living on the earth he is going to have to stop burning the fossil fuels, and do so almost completely and at once.

If the burning of coal, oil, gas and gasoline was not stopped within the next 25 years or so, the carbon dioxide in the earth's atmosphere will have increased to such a degree that it will make the local smog problems of the 1960s seem puny and academic. Most people don't realize that carbon dioxide is the real threat.

Mr. Schuck is from the Air Pollution Research Centre of the University of California. He said he was not trying to scare anybody.

### Another U.S. Organization

The National Tuberculosis Association of the U.S. announces that it is establishing a national commission for the control of "community air pollution", to be known as the National Air Conservation Commission. Its aims are said to be to publicize fact, to recommend policy and to stimulate action. It is not for us to judge whether another organization for such purposes is really necessary, but we cannot help wondering.

*Canada*

## JOHN L. SULLIVAN

Dr. Sullivan, formerly head of the New South Wales air pollution department, has now taken up his new post as director of air pollution research for the Canadian Government, with headquarters in Ottawa.

Dr. Sullivan contributed the Continental Report on Australasia for the London International Congress in October last.

### Stack Heights Handbook

The Department of Mechanical Engineering, University of Toronto, have issued a guide to *Minimum Stack Heights for Apartment Buildings*, by G. Ross Lord and Hans J. Leutheusser. The main purpose is for the protection of high buildings against the emissions from their own chimneys. Formulae are given for calculating the height the stack should rise above the roof of the building, according to the type of structure. The heights obtained are minima, and must be increased if interference from neighbouring buildings is likely. Such a guide would be useful to many British builders and architects.

*West Germany*

## NEW CLEAN AIR SOCIETY

Recognizing the importance of securing clean air, a group of private individuals in Hanover have formed in 1965 a "Society for Fighting Atmospheric Pollution" (Gesellschaft zur Bekampfung der Verschmutzung der Luft e.V.), and in November 1966 a first scientific meeting was held at which several papers were presented on the subject of air pollution.

The aim of the Society is to make public opinion aware of the dangers of air pollution and to encourage co-operation on all levels in order to overcome this problem. In their statement, the Hanoverian Society after listing industry, domestic smoke and vehicles, as the three main sources of pollution, says that while legislation has so far been concerned with industrial causes, there is still a lot to be done on the domestic and vehicle side.

The Society calls for a sense of conscience about the future state of their environment and intends to use the means of publicity to make the people of Hanover demand clean air measures.

At the first scientific meeting of the new Society, Professor Hans Harmsen, director of the Hamburg Institute for Hygiene, pleaded for the prohibition of lead compounds to petrol, serving as anti-knock agents.

As a result of these additives, the air above the roads was polluted in a manner bound to prove injurious to health, Professor Harmsen emphasized. Lead substances being passed into the body by way of the respiratory organs were about ten times as poisonous as lead ingested with food or water. While in industrial establishments serious cases of lead poisoning were only very rarely encountered nowadays, the number of cases of chronic lead poisoning among the city population had been increasing at an alarming rate.

*Italy*

## FLUORINE EMISSIONS

A story in the *London Evening News* reports on a "fluorine war" between a farming town and an industrial establishment in the Alto Adige valley in north-east Italy. In the township of Mori is a giant aluminium plant, the chimney emissions of which contain fluorine fumes.

A few miles downstream on the river Adige is the town of Chizzola, the main activity of which is growing grapes. The people claim the aluminium plant's fumes are poisoning them and their vineyards. The feud took on a new dimension recently when a bomb exploded in the factory. No suspects have been found.

The trouble began in 1928, when the plant was built. After it started operating, mulberry groves in Chizzola withered and died, cattle became crippled with bone calcification, and residents complained of aches and skin spots. The plant installed a filter and the adverse effects disappeared. But in 1963 the plant increased production and the complaints began anew. Now the health authorities have ordered the plant to reduce production and to put in new filters. Workmen were laid off until the filter could be put into operation.

*Europe*

## TWO MORE COMPANIES JOIN CONCAWE

Two more oil companies have joined the petroleum industry's cooperative effort in Western Europe to combat air, water and soil pollution, attributed to oil operations.

The two companies, Petrofina S.A., Brussels, and Société Nationale des Pétroles d'Acquitaine, Paris, are now contributing to and participating in Stichting CONCAWE, a foundation established in The Hague at the end of 1963 by The Oil Companies' International Study Group for the *CON*servation of *C*lean *A*ir and *W*ater, *W*estern *E*urope.

Thirteen oil refining companies, together managing about three-quarters of the nominal refining capacity in Western Europe, are now represented by CONCAWE whose principle role is to establish the technical background to pollution and to offer information on pollution abatement to the participating oil companies and authorities interested in solving pollution problems.

Other companies participating in CONCAWE are:
BP, Shell, Esso, Gulf, Caltex, Mobil, Compagnie Française de Raffinage, Union Générale des Pétroles, Gelsenberg Benzin A.G., Scholven Chemie A.G. and Union Rheinische Braunkohlen Kraftstoff A.G.

## ECSC PROGRAMME

The European Coal and Steel Community's High Authority unanimously approved a consultative committee's suggested research programme and its plans to earmark (over steel industry opposition) about $4 million for a five-year study of the pollution problem. ECSC's aim is to impose strict regulations governing air pollution in all six Community countries (France, Belgium, the Netherlands, Luxembourg, West Germany and Italy) as quickly as possible.

*Hong Kong*

## AIR POLLUTION SYMPOSIUM

In our last issue (p. 154) we reported on the setting up of a Committee on Air Pollution in Hong Kong. There has now been held a symposium on air pollution organized by the Engineering Society of Hong Kong. Three papers were read and discussed. They were "The Influence of Petroleum on Atmospheric Pollution", by J. A. Stocks, "Problems Associated with Atmospheric Pollution Confronting a Cement Manufacturer in Hong Kong", by J. S. Brooker, and "Meteorological Aspects of Air Pollution" by P. Peterson.

The aim of the symposium was to indicate the principal causes of air pollution and to provide a forum for the exchange of ideas. The paper by Mr. Peterson, of the Royal Observatory, showed that air pollution was continuing to increase. The three papers are reproduced in full in the March issue of *Far East Engineering and Equipment News*, Hong Kong.

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### New Source of Gas!

At a time when the production of gas from coal in Britain is rapidly diminishing, first because of the development of oil-based processes, and secondly by the advent of natural gas from the sea, the following passage, opening an article in "Coal Research", bulletin of Bituminous Coal Research Inc., U.S.A., comes as a distinct shock:

*Coal gasification is one of the big-payback targets of current coal research.*

*If pipeline-quality gas produced from coal can pick up only 10 per cent of U.S. gas demand projected for 1980, coal markets will be fattened by about 138 million tons a year. That is considerably more than the annual tonnage now consumed by general industry.*

*Will it happen? The U.S. Office of Coal Research expects gas-from-coal to be in the pipeline by 1975. The natural gas industry, with steadily shrinking reserves of a specialty fuel, should welcome the supplement from coal.*

*Gasification holds another trump for coal—elimination of its solid-state handicaps in competition with fluid fuels. One immediate bonus of coal conversion is a quick step up in air pollution control. It's easier to desulphurize pipeline gas than coal—hydrogen sulphide removal is a routine clean-up operation in coal gasification. Taking sulphur out of coal, or trace amounts of sulphur dioxide out of plant stack gases is still a complex, expensive problem.*

It sounds as if we were moving back to square one—but who knows, the situation might apply to this country too, one of these days.

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### Sale of Coal in Smoke Control Areas

A letter from the Minister of Housing and Local Government, Anthony Greenwood, to the North West Economic Planning Council, said that consideration was being given to a scheme in England and Wales under which coal merchants would have supplies cut off by the National Coal Board if they sold coal in smoke control areas.

Reference was made to the Board's Scottish Division trying out such a provision in their supply contracts. "At the moment," continued the letter, "this is experimental, but they are watching progress in the hope that something similar can be introduced this side of the border. If successful, such a scheme would, I think, be preferable to the creation of a statutory offence."

# *Road Vehicle News*

## Research Grants

Following a statement last December by Mr. A. Wedgwood Benn, Minister of Technology, that the Ministry planned to concentrate part of its aid to developing a viable electric car, two specialist manufacturers are reported to have applied for grants to speed their projects.

The Ministry, reported the *Guardian*, has also held discussions with the Lucas Company, which has announced an agreement with General Dynamics of America to develop under licence a zinc-air cell battery.

## Question in the House

**Mr. Longden** asked the Minister of Transport if she will now take steps, by legislation or otherwise, to ensure that all motor vehicles are so equipped as to reduce or prevent altogether the emission of dangerous exhaust fumes.

106. **Mr. John Hynd** asked the Minister of Transport if she is aware that measures are now being introduced in Western Germany and the United States of America to impose legal limits on the amounts of unburned hydrocarbons and carbon monoxide in the exhaust fumes of motor vehicles; and whether it is her intention to introduce similar measures in this country.

**Mr. Swingler:** My right hon. Friend will make new regulations controlling exhaust fumes from motor vehicles if and when research now proceeding in this country under the aegis of the Economic Commission for Europe shows this to be necessary and practicable. The limits and methods of measurement adopted in the United States of America are not necessarily suitable for this country. I am not aware that West Germany has yet imposed, or settled, limits.—(8 March, 1967).

## Esso Device

Esso has developed a device for eliminating a particular source of motor vehicle pollution—that caused by the evaporation of petrol from the fuel tank and carburettor. The device, known as ELCD (Evaporative Loss Control Device), traps hydrocarbon vapours from the fuel that would normally be lost to atmosphere. It later feeds them to the engine for burning them under controlled conditions so that they neither alter engine operation nor increase hydrocarbon or carbon monoxide emissions.

Hydrocarbon emissions emanate primarily from the crankcase, the exhaust and through evaporative losses. ELCD is claimed to reduce the loss by about one-sixth using a controlled absorption-desorption technique. A canister containing a charcoal absorbant traps the vapours before they can escape to the atmosphere and holds them until they can be removed and fed back to the engine.

In principle, the ELCD is adaptable to new cars with only moderate alterations to the existing fuel system. Data indicates that maintenance requirements should be minimal.

## Joint Research on Exhaust Emissions

Ford Motors and Mobil Oil have announced plans for joining forces in a research project, to cost £2·5 m., for the development of means to reduce harmful emissions from petrol-powered vehicle exhausts. The project will continue for at least three years, and provision has been made for other organizations to participate and to have access to and free use of the results of the research for anti-pollution purposes.

## Electricity Council Invites Tenders

The Electricity Council is inviting tenders from well established and reputable manufacturers for the supply and delivery of three types of battery electric passenger vehicles. Specifications have been prepared by the Council and quotations are asked for initial orders of 10 and 20 vehicles in each of the three categories. These vehicles will be used by Electricity Boards throughout Great Britain. Manufacturers are also asked to suggest retail prices for production quantities.

An Electricity Council spokesman said:—

"This marks a further stage in the efforts of the electricity supply industry to interest manufacturers in the production of viable electric passenger vehicles for town use and for commuting. The vehicles will be used by all Electricity Boards in the course of their day-to-day activities—for example, by service engineers, demonstrators and representatives.

"The opportunity will be taken to assess the performance of the vehicles in actual service, to let the public see them in operation, and, where possible, to enable experience of their use to be gained by various sections of the public."

### Council of Europe Medical Fellowship

Mr. A. Archer, F.A.P.H.I., Chief Public Health Inspector, Borough of Halesowen, has been awarded a Council of Europe Medical Fellowship for one month to study the effectiveness of plant used for preventing air pollution from iron and steel works. He will carry out the study in the Federal Republic of Germany.

Mr. A. Archer was a member of the Working Party on Chimney Heights and is also a member of the Working Party of Emissions from Iron foundries. He is a member of the Technical Committee of the Midlands Joint Advisory Clean Air Council. In October, 1966, he presented a paper on "Clean Air and the Ironfoundry" at the International Clean Air Congress held in London.

### New Gas H.Q.

The Gas Council is to occupy one of London's major new office buildings, the tower block at Marble Arch. The contract for letting the block, a development by Rank Estates Ltd., as the Council's headquarters, has just been signed. The Council will occupy the whole of the building, with the exception of the shops.

The total floor space is about 135,000 square feet, including the basement car park. The Council's staff, now spread over a number of offices, will be accommodated and it is intended, in due course, to provide a commercial and industrial display area, together with demonstration facilities.

### Desulphurizing Fuel Gases

An article in *British Chemical Engineering* (March, 1967) by A. J. E. Munro and E. G. Marsden describes an approach to the removal of sulphur from flue gases by treating the fuel to a partial combustion process by means of which the sulphur emitted is converted to hydrogen sulphide. This is removed by a catalytic process before the combustion is completed. By this means, using an alumina catalyst by means of which the hydrogen sulphide is converted to elemental sulphur more than 90 per cent of the sulphur in the fuel can be recovered.

### "Energy for the New Towns"

A report of the Conference on "Energy for the New Towns" held by the Combustion Engineering Association at the Hotel Majestic, Harrogate, on 2 and 3 November, 1966, is now ready. Copies may be obtained from: The Director, The Combustion Engineering Association, 70 Jermyn Street, London, S.W.1., at 40s. each.

### For Sale

Quantity of one inch anodized aluminium clamps to B.S.S. by well known manufacturer. Suitable for daily maintained instruments. No pressure applying device, but advice available. Normally 25/- offered at 7/6d. pair. Apply G. B. Stokes, D.C.P.H.I., Meriden R.D.C., Council House, Coleshill, Birmingham.

# NATURAL GAS AND CLEAN AIR

## *By F. J. Eaton*

*A Paper given to the East Midlands Division of the Society at Nottingham on 16 March 1967*

THIS paper has the following four subdivisions—North Sea gas, imported natural gas, conversion of appliances from town to natural gas, and clean air. The first three give the present position and possible future development of natural gas in this country, and on this is based the effect which this new indigenous smokeless and sulphur-free fuel can have on clean air.

The information has been taken from a number of publications and a list of these is given.

### North Sea Gas

The search for natural gas in the North Sea is proceeding rapidly and with outstanding success. It was about Christmas 1964 that drilling was begun on the first well, which incidentally proved to be dry, but by the end of January 1967 39 drillings had been completed, with gas finds in 14. A pipe line has already been laid to the shore from the B.P. find some 40 miles off the mouth of the Humber, and the pipe line on land from the Humber to join the imported methane pipe line at Totley, six miles west of Sheffield, will be operational towards the end of this year.

In April 1966 a find of "considerable importance" was announced by Shell-Esso from a well 30 miles off Yarmouth, and this was quickly followed by gas finds, slightly further out to sea, by the Gas Council/Amoco Group and by the Phillips Group. From the position of these discoveries, all in commercial quantities, experienced operators were convinced that here was something big, particularly as there is evidence that the rock formations and conditions are similar to those of the huge Slochteren field in Holland, probably the largest in the world, with reserves officially estimated at 60 million million cubic feet. Plans are being made for the gas from this field off Yarmouth to be brought ashore about the village of Bacton in Norfolk, and from here pipe lines will connect with the existing methane pipe line running from Canvey Island to Leeds.

Whilst all this activity was taking place in the North Sea, Home Oil of Canada were prospecting and drilling for gas and/or oil in East Yorkshire where there was already a small well producing about 2 million c.f.d. at Eskdale. Home Oil of Canada have been more successful, and at Lockton have found a well reported to be capable of a high rate of production, although the extent of the well has yet to be determined.

On the prediction of supplies, Sir Kenneth Hutchison in an address to the London and Home Counties Clean Air Advisory Council[1] said:

"While it is quite impossible to make firm predictions about the future the Gas Council has felt it sensible and prudent to base its long-term plans on the possible discovery of at least 4,000 m.c.f.d. during the next ten years. This is roughly equivalent to the great Slochteren field in Holland. Meanwhile the Council is planning firmly to incorporate the first 1,000 m. daily output into their existing and extended systems of transmission and distribution mains as soon as possible."

4,000 m.c.f.d. is 14,400 m. therms p.a. and is roughly four times the 1965-66 output of the British Gas Industry of 3,840 therms p.a.[2].

The search for natural gas in the North Sea is a fascinating story [3, 4, 5]. It was the discovery in 1959 of the large natural gas field at Slochteren in Holland and the presence of a small well at Eskdale in Yorkshire that encouraged the belief, long held by some geologists, that similar gas-bearing rock formations extended under the North Sea.

The natural gas at Slochteren is found in porous sedimentary rocks of the early Permian period known as the "Rotliegendes". To form a well these rocks must, first, overlie "source" sedimentary rocks containing carbonaceous deposits of a type favourable to gas and/or oil formation, and second, be covered and sealed by an impervious cap rock. At Slochteren[5] the source rock is coal, formed from the dead plants that grew in the tropical carboniferous swamps 300 million years ago, the reservoir rock is Rotliegendes sandstone 375 feet thick and 20 per cent porous and the cap rock or barrier above the reservoir rock is rock salt 4,500 feet thick. The reservoir rock is arched sufficiently to form an enclosure to prevent the gas escaping at the edges. In the North Sea the source rock might contain coal, or alternatively marine organisms such as plankton, bacteria and simple plants, such deposits usually give rise to oil and gas wells. One well in the North Sea has reported oil with the gas.

With the technical progress of prospecting for oil and minerals at sea it was necessary to define the offshore limits belonging to the adjoining Governments. An international conference of 22 nations in 1958 agreed a Convention that is now part of international law. The Convention named the prospecting area the Continental shelf, and this is defined as "the sea bed and subsoil of the submarine areas adjacent to the coast but outside the area of the territorial sea to a depth of 200 metres (656 ft.) or beyond that limit, to where the depth of the superjacent waters admits the exploration of the natural resources of such areas". A clause in the Convention refers particularly to areas such as the North Sea, which is surrounded for the most part by land. The seven Governments of Norway, Denmark, West Germany, Holland, Belgium, France and Britain have agreed their areas in the North Sea and that of Britain extends to a line representing the mean distance between Britain and the Continent.

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The next legal requirement was to draw up the conditions for the granting of licences "to search and bore for and get petroleum in continental shelf areas". These requirements are contained in the Continental Shelf Act 1964 and the various Orders in Council and Regulations issued under the Act. To date 23 Groups have been granted North Sea concessions and been allocated prospecting areas known as blocks.

From 1962 to 1965 geological surveys were made using the seismic technique, a method based on that used to detect earthquakes. A charge of 25 to 30 lb. of dynamite is exploded about 7 ft. below the surface of the water, a shock wave travels into the sea bed and is reflected from the interface where rock strata of greatly differing density meet. The low frequency vibrations produced by the shock wave are detected by an instrument called a geophone; they are then amplified and recorded on magnetic tapes from which a visual record is obtained. From these records the geophysicist can determine the size, structure and location of rock formation, also the possibility of gas and/or oil being present, but this can only be proved by drilling, which is very expensive. Wells in the North Sea are usually 8,000–10,000 ft. deep and drilling takes some 90 days at a cost of about £5,000 per day. The drilling rigs cost about £2½ million.

### Imported Liquid Natural Gas

In 1953 the Gas Council in co-operation with B.P. Exploration Ltd. commenced drilling operations on land in this country. No gas in commercial quantities was found, and attention was therefore directed to the possibility of transporting liquid natural gas in specially designed ships. At that time liquid natural gas had been transported up the Mississippi to Chicago in insulated tanks built into barges but no-one had attempted long trans-oceanic shipment of bulk loads of a liquid which boils at —258.6°F. at atmospheric pressure. The main technical problems to be solved were the choice of materials, the design and insulation of the storage tanks to contain a liquid boiling at such a low temperature, and keep the loss due to "boil-off" to a commercially acceptable amount.

Initial experiments were made with a converted tanker re-named the *Methane Pioneer*, first at Lake Charles, Louisiana, and then with sea trials in the Gulf of Mexico. In February 1959 the first voyage across the Atlantic to Canvey Island was completed. Seven round trips were made and these amply demonstrated that natural gas could be shipped safely in liquid form. The load carried was 2,200 tons. Then followed the building of the two sister ships, both at British shipyards, the *Methane Progress* and *Methane Princess*, the agreement to purchase gas from Algeria, and the building of a gas compression and liquid handling plant at the port of Arzew in Algeria. The methane tankers carry 12,200 tons of liquid methane and are comparable in size to crude oil tankers of 28,000 tons dead weight. The "boil-off" over the voyage of 2,500 miles is not more than 0.3 per cent and this is used and provides a third of the fuel required to drive the ship on a loaded voyage. Importation started in October 1964 and during the year 1965–66 51 cargoes of liquid methane totalling 546,000 tons and representing 275 million therms were delivered to the Canvey island terminal.

At the same time as the methane ships were being built work was proceeding apace on the routeing and construction of a 340 mile pipe line from the Canvey Island terminal to Leeds. The early part of the route adjoins the M1 motorway to Coventry and there are connections to centres of gas production in eight of the twelve Area Gas Boards. Welded steel pipe of 18 in. diameter was used for the pipe line, which is designed for a maximum working pressure of 1,000 lb./sq.in. It will be readily appreciated that in a pipe line of this length various difficulties were encountered for which answers had to be found. Probably the most difficult sections were those over the rocks and bogs in the Pennines and the Peak District, part of which had to be laid under adverse weather conditions. Then there was the spectacular laying of 1,500 ft. of main on the bed of the River Thames to make the connection to the East Greenwich works of the South Eastern Gas Board.

The amount of liquid natural gas evaporated into the pipe line at Canvey is programmed, according to the needs of the eight Boards, from a control room at Gas Council Offices, London.

### Conversion of Appliances from Town to Natural Gas

Fig. 1 shows the changing pattern of fuel usage in the United Kingdom.[6] After a period of recession, by 1960 gas had become more competitive, due largely to the development by gas engineers of cheaper methods of manufacture, based on oil feed stocks in place of coal, and to the development of more efficient appliances, particularly room heaters. The problem now was to ensure adequate supplies of gas

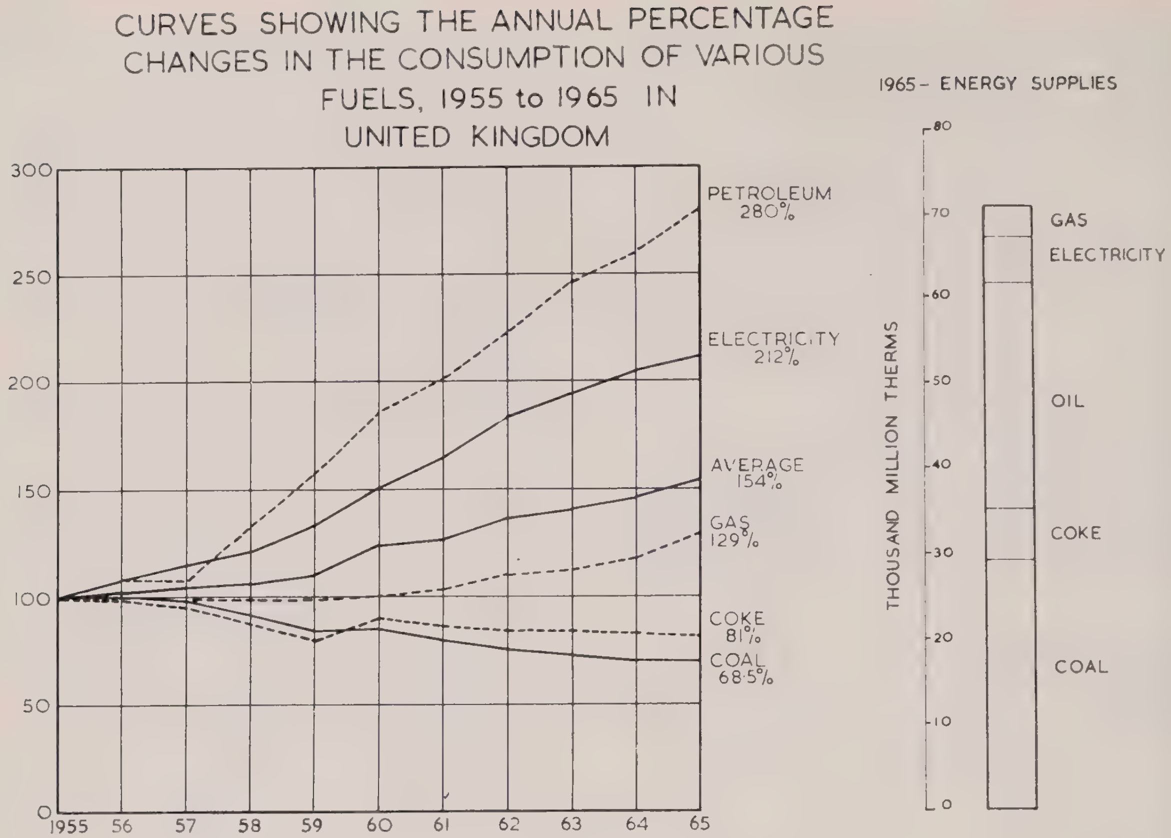

*Fig. 1*

by increasing the carrying capacity of the distribution system. Hence the interest in natural gas, which has twice the calorific value per cubic foot as the town gas now sold. In addition to calorific value natural gas has three other important differences from town gas which affect its burning properties and necessitate the use of a differently designed burner. These are a slower rate of burning (about a third that of town gas), more air required for combustion (roughly twice as much), and a higher ignition temperature. There is no problem in designing gas appliances to meet these differences but existing appliances will have to be converted to operate on natural gas.

The problems of conversion to natural gas were first tackled by Watson House, the research, development and appliance approval laboratories of the Gas Council.[7] Information was available from other countries on appliance conversion, but none of these countries, U.S.A., Canada, Holland and France have anywhere approaching the variety and choice of appliances that is available in this country. The Gas Council Approved List contains 1,750 domestic appliances (the number is 4,500 when different sizes of the same appliance are included). All gas appliances are type-tested by Watson House to comply with British Standards of efficiency, reliability and safety. Although the basic principles for the burning of natural gas and how conversions can be made are well known, these principles have to be applied to all the types of gas appliances existing in this country.

Fig. 2 gives four examples which illustrate the design principles of methane burners. The problem of the slower burning property is solved in one of two ways or by a combination of both. In the pinhole and ribbon burners the natural gas air mixture issues from the burner at a sufficiently low velocity to prevent flame lift. The pinhole burner provides the low gas velocity from the large number of separate small flames, and secondary air to complete combustion is drawn in round each flame. Generally too the drilled plate is of thin section heat

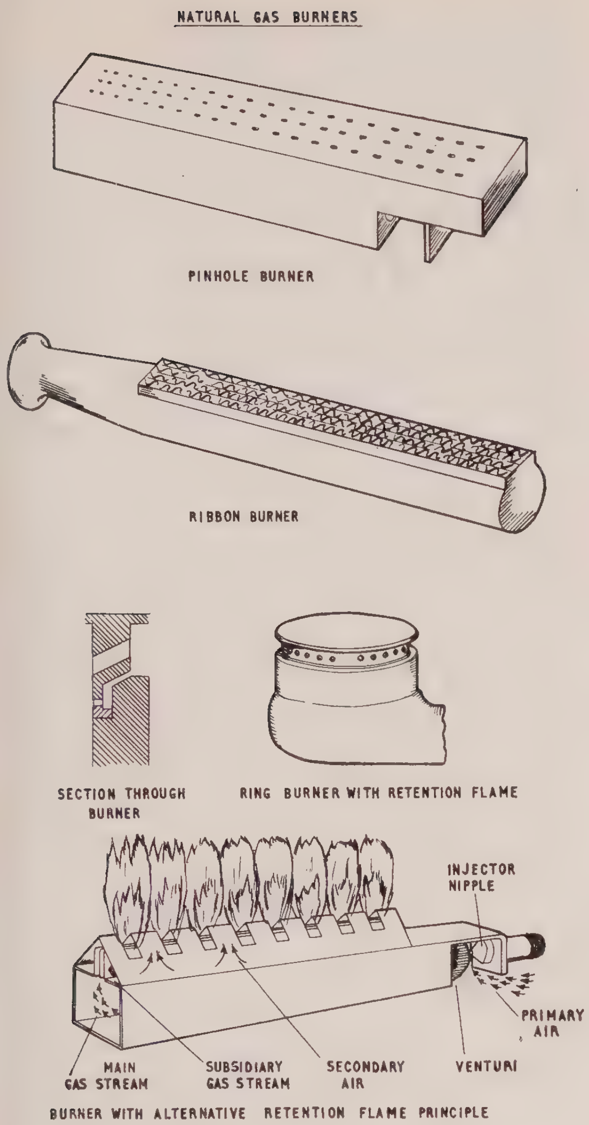

*Fig. 2*

resisting steel, which heats up quickly and maintains the gas air mixture at about ignition temperature. Flame retention is the second principle and this is illustrated in the section of the ring burner. In this the retention flame issues at low velocity below the main gas air mixture ports at which a higher velocity can be maintained. With an alternative design of flame retention burner the main gas stream is fed to central slots and the subsidiary gas stream issues from holes in the sides of this slot into the space formed by the triangular sectional cover, which is slotted to provide an entry for secondary air.

The other two properties of natural gas, its higher calorific value and the higher air requirement, are dealt with by using a gas pressure of 8 in. water gauge in place of the 5 in. normally used for town gas, and by reducing the size of the burner injector so that the heat output rating of the burner is the same on natural gas as it would have been on town gas.

With modern appliances the aim of designers is to simplify conversion from two gas to natural gas so that all that is required is to change the burner injector and increase the gas pressure. Modifications to thermostats, pilots and ignition systems are also required. For many existing appliances the town gas burner ports can be enlarged sufficiently to ensure the satisfactory burning of natural gas.

Watson House, in close co-operation with the appliance manufacturers have agreed the methods to be used for the conversion to natural gas of existing appliances. All new appliances are being designed for the simple conversion outlined above. Industrial and commercial appliances have been dealt with at the Industrial Research Laboratories of the Gas Council's Midlands Research Station.

To obtain practical experience of appliance conversion from town to natural gas the North Thames Gas Board completed a pilot scheme at Canvey Island, taking only two months, June and July 1966 for the appliances of 7,000 domestic, 164 commercial and 20 industrial customers.[8]

Much preliminary planning is involved in a conversion. A survey has to be made of the appliances on the district, and at this stage the consumers are fully informed of the conversion plans and later notified the date conversion is to be made. Appliance manufacturers have to be notified of the numbers of conversion kits required and arrangements made for storing and issuing the required parts and fittings. The area has to be subdivided and isolating valves provided so that each conversion sector can be isolated and all work in it completed in a day. At Canvey there were 24 sectors each containing between 300 and 400 customers. It will be appreciated that the planning must include the briefing and training of the conversion teams.

The conversion at Canvey used the imported natural gas and this is also the gas to be used in six conversion schemes planned by Area Gas Boards for this year. One of these is Burton-upon-Trent, which is in the area served by the East Midlands Gas Board and which has already been surveyed ready for the conversion to natural gas to take place.

The cost of all conversions is borne by the Gas Board, and on average is expected to be about £30 per consumer.

### Clean Air

The availability of fuels either intrinsically smokeless or that can be burned smokelessly is obviously an essential factor in the planning and success of a clean air programme. This section of the paper is concerned with fuels for Smoke Control Areas.

Initially the authorized fuels for Smoke Control Areas under the Regulations made in 1956 were coke of all kinds, anthracite, low volatile steam coals, "Coalite", "Phurnacite" and "Rexco", as well as gas and electricity. A number of brand named fuels have been added and the authorized fuels are now listed as gas, electricity, anthracite, low volatile steam coals, gas coke, hard coke and the brand named fuels "Gloco", "Sunbrite", "Coalite", "Rexco", "Cleanglow", "Sebright", "Phimax", "Phurnacite", "Homefire", "Roomheat", "Barnsley BurnBrite", and "Multiheat". This range of authorized solid fuels has been increased since British Standard 3841: 1965,[9] defines smokeless as smoke emission not exceeding an average of 5 grams per hour over the period of the test. Coal and oil are not intrinsically smokeless fuels but may be burned in Smoke Control Areas provided the smoke emission does not exceed that prescribed in the Act.

**TABLE 67. SMOKELESS FUELS**
**Disposals to the Domestic Market**

| | *Thousand tons* | | | |
|---|---|---|---|---|
| | 1955 | 1960 | 1964 | 1965 |
| Premium smokeless fuels produced by the Gas Industry | | | | |
| Cleanglow . . . . . . . . | — | 323 | 476 | 442 |
| Phimax . . . . . . . . | — | 100 | 321 | 326 |
| Other types (a) . . . . . . | 410 | 621 | 846 | 938 |
| TOTAL | 410 | 1,044 | 1,643 | 1,706 |
| Other smokeless fuels (b) | | | | |
| Anthracite . . . . . . . . | 629 | 753 | 975 | 1,008 |
| Dry steam coal . . . . . . | 835 | 717 | 614 | 639 |
| Phurnacite . . . . . . . . | 269 | 609 | 716 | 753 |
| Gas coke . . . . . . . . | 3,013 | 2,549 | 2,483 | 2,554 |
| Hard coke (Sunbrite) . . . . | 495 | 442 | 1,007 | 1,104 |
| Other . . . . . . . . | 35 | 75 | 139 | 136 |
| TOTAL | 5,276 | 5,145 | 5,934 | 6,194 |
| GRAND TOTAL | 5,686 | 6,189 | 7,577 | 7,900 |

(a) These include Warmco and Homefire and the large sizes of Coalite and Rexco.

(b) These are mainly boiler fuels but include substantial tonnages of some fuels suitable for improved open fires (e.g. Gloco and Sebrite) which are gas cokes to the British Standard Specification No. 3142.

The disposals of solid smokeless fuels to the domestic market are given in Table 67 of the Ministry of Power statistics.

The figures in the Table show that there has been a progressive increase in the total disposals of solid smokeless fuels. Assuming an index of 100 for 1955, the indices for 1960, 1964 and 1965 respectively are 109, 134 and 140. It is also clear that the total disposals of gas coke over the 10 year period is substantially constant, and the increase in tonnage comes from the fuels "Sunbrite", Anthracite, "Phurnacite", "Warmco", "Coalite" and "Rexco". With the Gas Industry's new methods of gas production there will be less gas coke manufactured in the future.

Present indications are that this run down will be over a period possibly five to ten years and that gas coke will be replaced partly by other solid smokeless fuels and partly by the "piped" fuels, gas, electricity and oil. The proportions of these fuels that will be used will depend, as it always has, on what the householder decides is the "best buy".

The Beaver Committee based their recommendations on coke as the main fuel which would be available for the first Smoke Control Areas. They then had this to say on the future:

> *Paragraph 76.* "Whilst we should not care to predict to what extent the solution will ultimately depend on coke we are entirely satisfied that from the sources we have indicated enough coke could be found to permit the creation of smokeless zones and smoke control areas as fast as the administrative action and the replacement of appliances would permit during the next five years at least. The complete programme will take much longer—some ten to fifteen years. By then there may well be new methods of smokeless heating or new sources of supply of smokeless fuels and it is possible that methods will have been developed of burning coal sufficiently smokelessly in domestic appliances, all of which may play a part in the final solution."

The new indigenous fuel which has turned up is North Sea gas and it is now proposed to examine what impact this is likely to have on clean air.

The first point to be considered is, is gas acceptable to the public. Fig. 1 shows the consumption of fuels for all purposes (domestic, commercial, industrial) and that since 1960 the demand for gas has been increased steadily and is now 29 per cent above the 1960 figure. In Smoke Control Areas the same upward trend has taken place. Table 1 gives the percentage of the total grants that were for gas in Smoke Control Areas in 20 London boroughs. These figures were obtained from a survey carried out by a London Gas Board.

**Table 1**

| *Date* | *Total number of grants* | *Percentage for gas* |
|---|---|---|
| 1956–1961 | 15,031 | 5 |
| 1962–1963 | 35,404 | 12 |
| 1964 | 10,440 | 30 |

The first period from the date of the Clean Air Act to 1961 shows the posi-

**Table 2—Use of Gas for Domestic Space Heating**

| *Gas sold (million therms)* | | | *Domestic appliances sold (thousands)* | | |
|---|---|---|---|---|---|
| *Year* | *Total* | *Domestic* | *Independent space heaters* | *Central heating boilers* | *Warm air units* |
| 1959/60 | 2590.8 | 1267.8 | 244 | 10 | 3 |
| 1960/61 | 2665.4 | 1291.2 | 265 | 18 | 8 |
| 1961/62 | 2735.9 | 1345.5 | 326 | 22.5 | 15 |
| 1962/63 | 2923.5 | 1493.3 | 532 | 35 | 21 |
| 1963/64 | 2978.6 | 1553.7 | 744 | 60 | 30 |
| 1964/65 | 3219.5 | 1726.8 | 920 | 90 | 48 |
| 1965/66 | 3505.0 | 2006.0 | 991 | 123 | 62 |

**Table 3—Comparison of gas with other fuels for the central heating of dwellings**

| *Period* | *Solid fuel (per cent)* | *Gas (per cent)* | *Electricity and oil (per cent)* | *Larger communal systems (per cent) (all fuels)* |
|---|---|---|---|---|
| Pre–1963 | 77 | 4 | 5 | 14 |
| 1963 | 50 | 18 | 30 | 2 |
| 1964 | 45 | 27 | 27 | very small |
| July/Sept. 1965 | 36 | 32 | 30 | 2 |

tion of gas prior to the impact of the high efficiency room heaters, and at a time when the price of gas was high in comparison with alternative fuels.

From 1962 to 1963 the new methods of gas production had pegged the price of gas, and sales of room heaters were increasing rapidly towards the million a year mark. In the period 1962–63 a significant change was taking place in the pattern of house heating; householders were changing to gas appliances, and those preferring solid fuels to the new heating stoves. These were more popular than the open fire appliances because of their higher standard of (24 hours a day) warmth and improved overall efficiency. In addition the new stoves provided the cheerful sight of the flames through the transparent glass doors. A further advantage of the heating stove is that it will burn a wider range of solid fuels than the open fire type of appliance. The changing pattern of fuel usage to gas appliances and solid fuel heating stoves was recognized in Government Circular No. 69/63 issued in December 1963, which allowed grants for these appliances. Thus the 30 per cent figure in the above table for 1964 is partly due to the increased Government grant, and partly to continued growth in demand. Further figures for 1965, but for six different London boroughs, show that the number of gas room heater grants to total grants averaged 58 per cent. Information from other Gas Boards confirms this figure of about 60 per cent of gas appliance grants in Smoke Control Areas in other parts of the country.

Tables 2 and 3 taken from the paper by C. H. Purkis and D. R. Wills[7] show the progress of gas for domestic space heating over the last six years and the comparison with other fuels in the central heating of dwellings.

There is no doubt that the property of natural gas which can make the biggest impact on clean air is that it is, for all practical purposes sulphur free. In the report of the Technical Committee of the National Society for Clean Air entitled Sulphur Dioxide—An Examination of Sulphur Dioxide as an Air Pollutant, natural gas is reported as containing 0·0002 lb. sulphur per therm, and that most of this comes from the odorant used to give natural gas the characteristic town gas smell. For comparison, the Technical Committee's Report gives the following sulphur contents of fuels, and these have for convenience been arranged in ascending order of sulphur content.

| | *Fuel* | *Per cent Sulphur* | *lb/Sulphur per therm* |
|---|---|---|---|
| | Natural gas | — | 0·0002 |
| (a) | Town Gas from new processes | — | 0·0002 |
| (b) | Liquefield Petroleum Gas | 0·005 | 0·0002 |
| | Paraffin or Kerosene | 0·04 | 0·002 |
| | Light domestic fuel oil | 0·08 | 0·004 |
| | Domestic fuel oil | 0·8 | 0·04 |
| | Anthracite | — | 0·05 |
| (c) | Coal | less than 1·0 | 0·05–0·1 |
| | Light industrial fuel oil | 2 | 0.11 |
| (d) | Coal | 1·6 | 0·12 |
| | Coke | 1·5 | 0·12 |
| | Extra heavy fuel oil | 4 | 0·22 |

*Notes:*

(a) This gas is one third of the total production.

(b) These gases are butane or propane or mixtures of these two gases.

(c) 25 per cent of total saleable coal has a sulphur content of less than 1·0 per cent sulphur. The range of lb/sulphur per therm is due to the range of calorific values.

(d) 1·6 per cent is the average sulphur content in British coals. 60 per cent of total saleable coal contains 1·0 to 1·9 per cent of sulphur.

The Technical Committee's report concludes:

> "In conclusion, it may again be emphasized that the problem of sulphur dioxide in the atmosphere is one that calls for a variety of contributory solutions. It is also apparent that there is no prospect in the immediate future of entirely eliminating this gas, but that, through the means that have been indicated, much can be done to reduce the total emissions and to reduce its concentration in the air we breathe."

One of the means indicated is the encouragement of the greater use of low sulphur fuels in the more vulnerable areas of our cities and towns. The development of the North Sea gas resources will make this encouragement more possible by the increasing availability of a sulphur-free fuel.

## Summary and Conclusion

This paper has dealt with the finding of North Sea gas in sufficient quantities for the Gas Council to base its future development on a change over from town to natural gas. The liquid natural gas imported primarily to enrich the gas made by some of the newer processes is now being used to supply the first conversion areas.

Since the passing of the Clean Air Act in 1956 there has been a significant change in the pattern of domestic fuel usage. Solid smokeless fuels have increased in types and in sales.

Town gas has gained in popularity with the public, particularly for domestic space heating, both with room heaters and central heating. Further, it is being used much more widely in Smoke Control Areas. This has been attributed to public demand for a convenient fuel and higher standards of heating, as well as to the improved competitive price position. The price for North Sea gas is still being negotiated, but the cost will certainly be lower than that of manufactured gas. The competitive position will improve but it is too early yet to say by how much and how soon.

There is no doubt that North Sea gas, the new indigenous, smokeless and sulphur-free fuel must play a big part in furthering the cause of Clean Air.

*Acknowledgement.* I should like to thank all who have helped me in the preparation of this paper and for providing me with the information contained in it.

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# Coal Rationalization

## D. J. Ezra

*At a recent conference on "Power in the 1970s", in London, D. J. Ezra, the new Deputy Chairman of the National Coal Board, spoke on "Coal—Rationalization and Realignment." Following are excerpts from his address.*

IN the field of energy, this country is going through times as momentous as were involved in the invention of the steam engine. New sources of energy, new methods of converting primary energy into power, new ways of using power—all these changes are occurring at the same time, and will undoubtedly have a profound effect on the economy of the country.

While there is no doubt about the importance of these developments and the promise they hold out, there is one fundamental issue yet to be resolved. That is, how to reconcile the benefits of the new fuels and their usage with the effective satisfaction of the *total* fuel needs of the country, bearing in mind that the new fuels—natural gas and nuclear energy—are unlikely to meet more than a part of these total requirements in the foreseeable future. This issue will no doubt figure largely in the review of fuel policy currently being carried out by the Ministry of Power.

The important background factor is the virtual certainty of continually rising energy requirements, which at present total something like 300 m. tons of coal equivalent per annum, and could approach 400 m. tons by 1980. By the early seventies natural gas, on the latest estimates, is expected to yield 2,000 m. cubic feet per day, which roughly equals 25 m. tons c.e. per annum. A further 1,000 m. cubic feet would bring the figure to between 35 and 40 m. tons c.e. Nuclear power could contribute another 30 m. tons by 1975, assuming the second programme goes ahead as planned. This would leave the best part of 300 m. tons still to be provided by coal or oil.

The new structure of the National Coal Board makes for a close-knit and powerfully organized industrial complex, controlled from the centre as to general policy and objectives, but with maximum freedom being given to the managements of the individual enterprises to carry out the policy and achieve the objectives.

At the same time as the Board has reorganized its management structure, it is carrying out a massive programme of modernization and concentration on the mining side. At Vesting date in 1947 there were 950 mines in operation, 685,000 mineworkers, with a productivity of 21·5 cwts. per manshift producing some 197 m. tons (including opencast). At present there are 440 mines and 410,000 mineworkers; and they have achieved a productivity of 39 cwts. (an increase of over 80 per cent). By the end of 1970 the number of mines will have been reduced to 310 with a labour force of 315,000 and they will have a productive capacity of 170/180 m. tons p.a. (including opencast).

There are two significant features of this programme. The first is the speed with which it is being carried out. During the past two years closures of uneconomic pits have been undertaken at the rate of one a week, and this is likely to continue until the programme is completed. Closures on this scale can only be achieved through close consultation with the mineworkers' union, and extreme care has been taken to avoid social hardship through redeployment and other means. The second feature is the major technological development associated with the programme. Production is being concentrated as far as possible in pits with good reserves and a capacity of a million tons or more. Mechanization in these pits is virtually complete and substantial progress is being made in the installation of remote-control operations which could eventually lead to the greater part of the workings of a pit being controlled from the surface. Already a number of underground operations are worked in this way, such as the control of transfer points. British mining leads the way in this new field and has attracted much attention from other mining countries.

### Costs

The whole object of this programme is to contain and reduce costs. Lord Robens has set as an objective the production of substantial quantities of coal at a cost of 3d. per therm. This would enable coal, as a fuel for use at power stations or other major industrial consumers, to compete strongly with other fuels, either actual or prospective. The industry is already producing 126 m. tons at a cost of under 5d. a therm, and of this, 70 m. tons were produced at under 4d. a therm and 12 m. at under 3d. a therm. Indeed, at one new pit the cost is down to 2½d. a therm. Fifty pits have now been marked out for priority in recruitment, capital investment, and managerial "know-how". These pits, which are spread throughout the coalfields, produced 35 m. tons in 1965/66; with additional manpower and equipment they are capable of producing another 16 m. tons and adding another £50 m. to the return on the Board's investment.

The object of all these measures of rationalization and modernization, whether in directly controlled or related activities, is to enable the British coal industry to face up to the increased competitive pressures exerted by the new fuels now being brought into play. The purpose is to ensure that the substantial investment already made in the industry can, through these measures, form a continuing and competitive basis for the supply of a large part of the country's fuel requirements throughout the seventies and beyond. The important factor is that there is substantial scope for savings through the rationalization programme now being so vigorously applied. When this programme is completed by the early seventies, the country will have at its disposal a streamlined industry, with production concentrated at large and efficient units, and a newly planned and economic transport and distribution system to bring the fuel to the customer. There should be positive prospects for the coal industry, in its re-planned and rationalized form, to continue to supply a substantial share of total fuel requirements.

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### Solid Fuel Information for Architects

A series of informative booklets under this general title has been prepared by the College of Fuel Technology in consultation with the Technical Information Service of the Royal Institute of British Architects and Brunton, Baden Hellard and Barbyer, Chartered Architects.

The booklets, of which eight have so far been published, have been issued by the National Coal Board. The titles are: Solid Fuels, Storage of Solid Fuel and Ash, Automatic Firing, Solid Fuel Boilers, Chimneys, Heat Distribution, and Heat Emitters.

The booklets, which are attractively produced and printed, are well-arranged, concise, and informative. They should be of considerable guidance to architects and builders. From the clean air viewpoint the booklet on chimneys is especially to be welcomed. Not only does it deal with the design and construction of chimneys, but their heights, with reference to Clean Air Act requirements, are fully discussed.

The booklets are not priced and distribution is of course primarily to those professionally concerned. Inquiries should be addressed to the Marketing Department of the NCB at Hobart House, Grosvenor Place, London, S.W.1.

# Air Pollution at RSH Congress

## Papers by

## Albert Parker, F. G. Sugden and J. Beighton

*Three papers on air pollution were presented at the Royal Society of Health Congress at Eastbourne on 24–28 April. Neither space nor restrictions on complete reproduction allow us to publish them in full, but following are reports, with extensive extracts.*

## REDUCTIONS AND PROBLEMS OF AIR POLLUTION IN GREAT BRITAIN, FROM 1938 TO 1967

*Albert Parker, C.B.E., D.Sc., C.Eng., F.R.I.C.*

After surveying the history of action against air pollution Dr. Parker examined the estimated emission of smoke and sulphur dioxide from the uses of fuels for 1938, 1956 and 1965. The table for which he has been responsible for many years will be familiar to readers of this journal or it is published in the Society's Clean Air Year Book. The totals for the two pollutants, for the three years referred to are of interest and significance, and are as follows (in millions of tons):—

| | |
|---|---|
| *Smoke* | |
| 1938 | 2·71 |
| 1956 | 2·25 |
| 1965 | 1·10 |
| *Sulphur Dioxide* | |
| 1938 | 4·13 |
| 1956 | 5·33 |
| 1965 | 6·43 |

The detailed tables show that the main important changes are the decrease in smoke from all sources, domestic, railway and industrial and increases in sulphur dioxide from the use of coal, coke and oil. The largest increase of sulphur dioxide is from oil used for industrial purposes, but this is because the oil used by industry is as shown in another table in the paper—has increased from 1·4 m. tons in 1938 to 36·6 m. tons in 1965.

One statistical analysis and figures follow, and the author then discusses pollution from road vehicles. His concluding section, on the future, is of much interest and is reported verbatim:

### The Future

Over the next ten years the population of Great Britain is likely to rise by 3 or 4 m. or about 6 per cent, to reach between 56 and 57 m. Over the same period the consumption of fuel and power in this country will probably rise by about 15 per cent to reach the equivalent of 330 to 335 m. tons of coal per annum or about 5·8 tons of coal per capita per annum. The main difficulty in attempting a forecast is to assess to what extent the different forms of fuel and energy are likely to contribute to the total demand. The demand for each of the different forms may be affected not only by availability, basic costs, and consumer preference but also by political and national economic factors. In addition there are the recent discoveries of what are believed to be substantial reserves of natural gas of good quality below the bed of the British area of the North Sea. The real extent of the recoverable gas from these reserves cannot yet be properly estimated. It seems likely, however, that the amount will be equal in thermal value to at least 50 times the present annual amount of gas supplied by the nationalized gas industry.

Taking the various factors into account, so far as they can be assessed, and assuming that there will be no drastic change in the political and economic situation, it is probable that by 1976 there will be the following approximate changes in Great Britain from the annual demands in 1965 for the several forms of fuel and power, (i) a reduction of 20 m. to 25 m. tons in the consumption of coal, including a reduction of 7 to 10 m. tons in the domestic consumption of bituminous coal, (ii) an increase of between 25 m. and 30 m. tons in the consumption of oil, including an additional 2·5 to 3 m. tons of motor spirit and 1·5 m. tons of diesel oil for road vehicles, (iii) a trebling of the amount of electricity generated at nuclear power stations, and (iv) a doubling or trebling of the amount of gas used, with much less made from coal, more made from oil, and a substantial proportion as natural gas.

The object of these estimates (or guesstimates) of the fuel and power consumption in 1976 is to assess the probable effect on the extent of pollution of the air in this country. As a result of the estimated changes there will be a reduction in the quantity of smoke emitted, particularly in the thickly populated areas. It seems probable that the amount of sulphur dioxide discharged into the air will be no greater in 1976 than in 1965, though the total weight of coal and oil consumed will be greater. With changes in the sources of oil and in refinery operation, it is probable that the overall average sulphur content of the oils will be less in 1976 than in 1965. With a reduction in the amount of sulphur dioxide discharged from low domestic chimneys, there should be a decrease in the concentration of sulphur dioxide in the air near ground level.

It is unlikely that there will be a substantial decrease, if any, in the total quantities of carbon monoxide and hydrocarbons discharged in the exhaust gases from road vehicles for the country as a whole. Though by 1976 the petrol engines of the newer cars will achieve better combustion with appreciable reductions in the percentages of carbon monoxide and hydrocarbons in the exhaust gases, the total number of motor vehicles will be greater, and many of the older vehicles with the less efficient engines will still be in use. In the busiest traffic areas of the larger towns there is already considerable congestion at times that could hardly become much worse. With more efficient engines and more main roads by-passing the centre of towns, there should be no increase in the concentration of carbon monoxide and other constituents of the exhaust gases in the air near ground level in the busiest streets and by 1976 there may be a decrease.

Even the improvements suggested for 1976 in reducing the pollution of the air we must breathe will not be achieved without constant effort and vigilance.

# LOCAL AUTHORITY PROBLEMS IN AN INDUSTRIAL AREA

*F. G. Sugden, D.P.A., F.R.S.H., F.A.P.H.I.*

This is a perceptive and constructive paper, in which a great deal of ground is surveyed in a practical manner. The measurement of air pollution is first discussed and then follows an examination of the practical problems in the control of air pollution—industrial smoke, grit and dust, and sulphur dioxide, followed by consideration of the domestic problem and finally some pertinent observations on Administration. We quote extracts as follows:—

## Grit and Dust

If, as seems likely, local authority control of grit and dust emission has not kept pace with their control of industrial smoke emissions, there is little doubt that the major reason has been the lack of guidance or information upon what might be regarded as acceptable standards. It is recognized that one of the major difficulties in formulating standards has been the difficulty of finding a method of measurement both reliable and capable of being relatively simply carried out. The Minister of Housing and Local Government set up a committee to consider this problem and its report as awaited with interest.

The Clean Air Act only deals with grit and dust emitted from fuel burning appliances. Other processes such as slag and stone crushing, granite quarrying, shot blasting, grinding and polishing and concrete making may give rise to grit and dust problems. These are normally subject to the nuisance provisions of the Public Health Act, 1936, but it is suggested that they could with advantage be transferred to the Clean Air Act. This would then allow the local authority to insist upon adequate arresting equipment before any new premises were operated.

### $SO_2$ and Chimney Heights

Local authorities still face problems in fixing proper chimney heights. Section 10 exempts premises used as residences, offices and shops although some assistance may now be obtained from the Building Regulations which allow the authority to fix chimney heights for high rating appliances, i.e. those with a rating of more than 150,000 Btus per hour, when installed in offices, shops or residences. The height must be such as to prevent nuisance or prejudice to health from emissions entering the building. Although the matter is not absolutely clear presumably the authority may use the standards laid down by the memorandum where they are appropriate.

A chimney height may be fixed upon a proposal to use say a fuel oil with a sulphur content of 1 per cent but the occupiers may apparently change over to one of the heavy oils with sulphur content of 3–4 per cent without any change in the height of the chimney. Fixed chimney heights should be capable of being amended if the fuel used is changed.

School chimneys have proved a problem in many parts of the country. As they do not require approval under the Building Regulations they are exempt from Section 10 but it is extremely difficult for public health inspectors to enforce chimney heights on private industry when publicly owned buildings do not meet the same standards. Some education authorities have been reluctant to meet this moral obligation and it is understood that in some cases they have been supported in this by the Ministry of Education.

The greatest difficulty arises from the conflict of view between pollution control interests and architectural and town planning interests. The real problem is that within its respective sphere each interest is right. A tall chimney is seldom a thing of beauty or of architectural interest, but the public health inspector is faced with the fact that where sulphur producing fuels are to be used there is no alternative to a fixed chimney height. The architect and town planner are in the happier position that where a required chimney height is unacceptable on architectural or town planning grounds they have the alternative of using sulphur free fuels such as gas or electricity.

### Domestic

Why are there so many authorities doing so little? There are some authorities which made a start in 1959 or 1960 but stopped when the work became more costly. There are others which have never started at all.

With many non-starters it seems to be more a case of apathy than of antipathy towards the idea. Some authorities believe that a smoke control programme will be unpopular with the electors. This might have been true a few years ago but this view has generally altered with the changed ideas on house heating now being shown by so many householders. Some authorities claim that their pollution from industrial sources is so heavy that they cannot deal with domestic smoke until industrial pollution is overcome.

One cannot help feeling that such a view is based upon a wrong appreciation of the position. In such an area there are two evils—industrial pollution and domestic pollution—and common sense would suggest that they should be dealt with concurrently. Other authorities have hesitated because they are not happy about supplies of smokeless fuels. The fact that the Minister will not confirm an order until he is satisfied that there is sufficient smokeless fuel available for the area ought to be a reasonable assurance for such authorities. As far as can be ascertained, the only difficulties experienced by local authorities making smoke control areas has been the rare occasional breakdown in deliveries—something which occurs equally from time to time with coal. There has been no general shortage of smokeless fuel and indeed in many parts of the country there is an overabundance of it. If, however, these authorities mean there is a shortage of soft coke and that they are waiting for this sort of fuel to become available, the prospects of them ever starting are rather bleak.

Mining areas still represent a problem and we have to accept that we have here, in many cases, antipathy to the very idea of smoke control. In the early days miners had a genuine grumble about losing the benefits of the concessionary coal, but this is said to have been solved by more generous offers made of recent years by the National Coal Board. Where mining areas have declared complete opposition to domestic smoke control areas they may well be acting contrary to the best long-term interests of the industry in which they work. Smoke control areas are bound to increase in number as the years go by, and the well-being of the coal industry may depend upon the extent to which the general public accept the use of solid smokeless fuels in preference to other fuels. Might it not prove a first-class sales line if the miner showed his confidence in these fuels by agreeing to change over to their use?

One cannot help feeling that there has been a lack of sufficient drive from the central government to persuade reluctant local authorities to take up smoke control.

What are the problems experienced by authorities carrying out smoke control programmes? Some say that staffing has been a major difficulty and we are all aware of the shortage of public health inspectors. Much of the work can be done by suitably trained technical assistants working under the supervision of a public health inspector and many authorities have found no difficulty in recruiting suitable staff for this work.

Difficulty arises sometimes from delay in confirmation of Orders by the Minister and this procedure could be speeded up with advantage. The necessity for a public enquiry if there is even only one unwithdrawn objection seems unrealistic, and the Act should be amended to remove this obvious waste of time and money in cases where apparently 99 per cent or more of the people concerned have no objection. It would also be useful if, where local authorities are operating declared and published smoke control programmes, householders living in areas to be subject to smoke control in the next three, four or five years could be paid grants if they converted their appliances for the use of smokeless fuel before such an order was made. Or if it was felt that this opened the door too widely might it not be possible to have some administrative arrangement whereby approved work done in anticipation could be recorded and grants could be paid when the order was made. A recent amendment of the Clean Air Act allows this to be done for approved work carried out between the making of an order and its confirmation. Is there any reason why this should not be extended?

Local authorities who made smoke control areas based upon the use of soft coke are sometimes apprehensive about the future supplies of this fuel. Area Gas Boards are under an obligation to the Ministry to provide sufficient supplies of the fuel for the needs of the areas based upon it. It is hoped that this arrangement will not be cancelled unless or until there are in the area sufficient supplies of other solid smokeless fuels capable of being burnt upon the appliances so comparatively recently provided with grant aid. It is almost out of the question to consider any replacement of these appliances unless it is on the basis of 100 per cent exchequer grant.

Much of the criticism of smoke control work is inaccurate and ill informed, and much of it can be prevented if the local authority will keep the public fully acquainted with what is happening at every stage in the making of a smoke control order. Many local authorities have gone a long way to solving this problem by the issue of locally produced clean air handbooks, and the success of their efforts can be measured by the comparatively small number of objections they receive to their orders.

### Administration

Air pollution recognizes no local authority boundaries. It is therefore important that authorities should know what their neighbours are doing and that wherever possible measures can be planned for an area rather than for the individual authority. In some parts of the country the problem has been met by the formation of area or regional clean air committees. These committees, with the exception of one in the Sheffield area are usually advisory and have no enforcement powers, but they provide a means for representatives of the authorities to get together and exchange ideas, and discuss their problems. They enable local authorities to speak with one voice—and unity is strength. They can help to provide uniform standards throughout a particular area—a feature especially valuable in domestic smoke control work. They can carry out planned surveys of pollution levels over a wide area, and can co-operate to ensure that necessary instruments are sited to provide the most useful type of information, and they may help in encouraging constituent authorities who are lagging behind in the work.

A West Riding Regional Committee which has existed since the 1920's has recently been sending members round to persuade non-starters to commence domestic smoke control. A thriving committee in the West Midlands has made special progress in fixing standards for arresting equipment on cold blast cupolas after consultation with the industrialists of the area. As mentioned previously the Tees-Side Committee has recently made a detailed study of pollution trends since the inception of the Clean Air Act. Local authorities in parts of the country where such area committees do not exist might, with advantage, consider setting them up.

## THE SPECIAL INDUSTRIAL PROCESSES

*J. Beighton, B.Sc., C.Eng., F.R.I.C.*

**The introductory paragraph to Mr. Beighton's paper may be quoted in full:**

The process to be discussed in this paper are amongst those which form a vital part of the industrial structure on which we in Britain depend for our prosperity and standard of living. They have to satisfy increasing and essential production requirements in a pattern of living which is getting progressively more intense and complex. They have to do this in ways which are competitive and which thus have continually to be alive to new discoveries and improvements and ready to take advantage of them. But these processes qualify in this paper for the term "special" because they contain particular air pollution difficulties. Thus is established the problem of preserving health and amenities of living against essential processes which need freedom to develop and which are subject to the same general laws of physics, chemistry, engineering, economics and human fallibility that govern us all. Moreover, whilst the available technology to prevent air pollution has made enormous strides, present day standards and public awareness of clean air are more exacting than ever before.

Following this the author discusses the Alkali &c. Works Regulation Act, and the factors relating to control. He then follows with examination of some of the processes with which the Inspectorate is concerned, namely, sulphuric acid, nitric acid, petroleum and petrochemicals, iron and steel works, copper works, aluminium works, electricity works, gas works and ceramic works. From this selection we have had to make a further selection, picking out three of the sections.

### Petroleum and Petrochemicals

These industries have been discussed in some detail in the 94th (1957) and 102nd (1965) Annual Reports of the Chief Alkali Inspector for England and Wales but a few salient points are touched on here. Tremendous growth has taken place in the last 15 years. In 1938 crude petroleum refined in England and Wales amounted to only 2·5 m. tons and in 1950 it had reached only 8·3 m. tons, yet in 1965 it amounted to 60·5 m. tons and by 1970 it may be over 80 m. tons. The Alkali Inspectorate were in contact with these developments from the start but much had to be learned. The sheer size and complexity of a modern refinery and the nature of materials handled present a high pollution potential and demand very exacting standards of engineering, housekeeping and preventive equipment. Some of the large quantities of gases which are produced contain appreciable amounts of hydrogen sulphide and also sulphur compounds of the mercaptan type which have fantastic smell potential. Sulphur is recovered from these gases where practicable before burning them under process units or boilers on site and dispersing any resultant sulphur dioxide from remaining sulphur, from high chimneys. A flare system is also essential whereby volatile products which have to be released through emergency or pressure relief can be burned. Avoidance of smoke at these flares is sometimes difficult and one improvement technique is to inject steam at the flare. Complete immunity from trouble at refineries cannot be given and it is a matter of trying to keep incidents to the practicable minimum. Refinery staffs are highly organized to watch for emissions and to investigate complaints. It is useful to reflect at times when investigating a temporary breakdown just how much, otherwise, is being kept securely contained day after day.

The cracking and thermal reforming or petroleum refinery fractions provide products which form the basis of the petrochemicals industry. This industry is now a most important source of synthetic organic chemicals. Ethylene, propylene and butylene are three important starting materials obtained from cracking and/or thermal reforming but others are also obtained such as acetylene, methane, ethane, benzene, toluene, and xylene which are similarly valuable. Methane produced petrochemically is now being reacted with sulphur to make carbon bisulphide and replacing older manufacturing methods. Acetylene is a starting material for vinyl compounds used in plastics manufacture and it seems that the petrochemical route to acetylene will eventually replace the older and dustier route via calcium carbide from coke and limestone. These new processes are not established without suffering their share of teething-troubles and creating new problems. The process for carbon bisulphide manufacture mentioned above had to undergo a number of shut downs with burning of methane at safety flare which caused a good deal of local comment, but plant difficulties are now being largely overcome. Ethylene has a potential for damaging certain vegetations and can be lost under certain circumstances from petrochemical processes thus providing another issue for study.

### Iron and Steel Works

In England and Wales in 1964, 15·8 m. tons of pig iron and 23·9 m. tons of crude steel were produced. These levels were well over twice those for 1938. In size and range of tasks this section of processes was perhaps the most difficult of those inherited under the 1958 Alkali &c. Works Order, but the industry has responded with great spirit.

The relatively new technique of ore pre-treatment for blast furnaces includes processes of drying and sintering. These are dusty processes and have to be fitted with arrestment equipment of high performance. For dust emissions of this type the target requirement is that they shall not exceed 0·2 grain per cu. ft. S.T.P. of exit gases.

Over half the steel now made in England and Wales employs the use of tonnage quantities of oxygen. This creates the familiar red brown iron oxide fume and the problem is a twofold one of adequately extracting the fume and then treating it at an efficiency high enough for the final emission to be nearly colourless. The Alkali Inspectorate's requirement is that the exit fume concentration shall not exceed 0·05 grain per cu. ft. S.T.P. Such issues as this have involved an immense contribution by industry and since 1960 well over £20m. has been spent on fume arrestment plants, plus the cost of operation and maintenance. One iron oxide fume problem that has proved intractable is that from the Bessemer Converter where the form and mode of operation of the furnace prevent its practicable containment. Fortunately only two or three works in England and Wales are now using Bessemers and plans are in preparation for their replacement by other more amenable process plants.

Recent years have seen dramatic increases in the size and use of electric arc furnaces. The larger units use direct extraction of process emissions from the furnace, prior to gas cleaning, to avoid the immense volumes which would result from air dilution if hoods over the furnaces were used. This direct extraction technique gives rise to an explosion hazard due to the particular contents of carbon monoxide and other combustible constituents which are present in the undiluted gases. Design has to include special precautions such as controlled burning of these gases, explosion relief facilities etc., but even so explosion difficulties have been experienced for reasons not yet fully understood, and the subject is still under careful investigation.

Another new development in the steel industry is the Fuel–Oxygen–Scrap (F–O–S) or Oxy-Fuel process which is regarded as a possible future alternative to the electric arc furnace. Oil or gas is used with oxygen and it is claimed that melting and refining can be carried out without exceeding the fume level of 0·05 grain per cu. ft. Success of the process appears to depend a lot on the type of steel involved and time has been allowed for firms to evaluate it as an alternative to normal oxygen lancing, but it has been agreed that fumeless refining shall have been achieved one way or the other by the end of 1967.

In the iron foundry trade the hot blast cupola is a continuing problem. The provisional best practicable means of arresting the larger sized particulate matter and dispersing the fumes from a high chimney has served a very useful purpose and has worked well in a number of cases but the necessity to pursue the question of fume arrestment is well appreciated. About ten plants have now fitted or are fitting equipment such as electrical precipitators, bag filters or high efficiency wet washers and the current need is to assess these realistically over fair working periods to see how far a practicable solution has been reached for general use.

### Ceramic Works

The pottery trade, for so long identified with the Stoke-on-Trent area as a classical smoke problem, is smoky no longer and in 1965 only 11 operable coal fired bottle ovens remained here with practically all the pottery being made by smokeless firing methods not scheduled under the Alkali Act. It is in the heavy clay industry where the problems are found. The Alkali Inspectorate is pursuing with the trade generally, a programme of improvement and conversion to firing free of dark smoke and with chimneys of height to disperse combustion products and emissions from the clay, but in addition there are some special problems peculiar to certain sections of the trade. Space here allows only the following brief mention of the latter.

The use of salt on kiln fires for glazing in the sanitary pipe industry creates a difficult acid fume and mist which it is not practicable to remove by scrubbing and chimneys not less than 120 ft. high are required for dispersal. Fortunately it seems that the bulk of the industry will turn more and more to the new techniques of applied ceramic glaze and vitrification as the preferable way of overcoming this trouble.

The Staffordshire area bears continuing witness to the dark smoke emissions in the manufacture of high quality blue engineering bricks and arising essentially from the special need to restrict air to the kilns at certain times in order to obtain chemically reducing atmospheres. The position is improved but not solved. Experiments with steam and with water injection to the kiln fires give cause for some new hope but a lot of investigation is yet required. The Fletton brick industry is concentrated around Peterborough, Bedford and Bletchley and accounts for some 45 per cent of all bricks produced in England and Wales. Tall chimneys are used but the concentration of work is such that fluorine compound emission causes some farming hazard relative to cattle. In addition there is a peculiar smell problem which may be mercaptan in origin but the precise component of which has not yet been identified. This most vexing problem continues under investigation. The application of injection oil firing to some continuous kilns has, in some cases, caused acid soot troubles and although the principles of this are well understood the clarification of factors controlling any particular case can be a laborious business.

The special industrial processes are with us and we need them. They have co-operated very well and the writer would argue fair credit for what they have achieved. However, they cannot be hidden and it is not possible to be unaffected by them all the time. Particular problems are still evident and no doubt new ones will occur for this seems part of the price of progress in other directions. As local authorities rightly strive to improve and replan their communities, difficult process emissions come under increasingly critical scrutiny. This is understandable for clean air in relation to health and amenity is now firmly written into standards of living. The essential problem will continue to be the establishment of the fair optimum for all parties concerned and as the margin for improvement gets less there grows a need for more knowledge and more precise and composite assessment of given cases.

## Sheffield and District Committee

The Sheffield and District Clean Air Committee remains the only statutory body carrying out the provisions of the Clean Air Act on behalf of its constituent local authorities. Its report for 1966 has just been received, and again it shows excellent progress in its task. The pollution measurement records are given and show a continuation in the steady fall of both smoke and sulphur dioxide that had been noted in previous recent years. Thus for the three years 1956-58, the average smoke figures, per gauge (in microgrammes per cubic metre) was 309; for the three years 1964-66 the average was 137. For sulphur dioxide the corresponding figures were 282 and 160 respectively. That the sulphur dioxide figures should be falling almost as steeply as smoke, is, as the report says, "somewhat surprising". It is nonetheless gratifying.

11,353 chimneys were observed during 1966, with an average of 0·26 minutes smoke emission per half hour. 148 complaints were dealt with, 80 abatement notices served, 59 letters sent, and four prosecutions taken.

# SMOKE CONTROL AREAS

## Progress Report

### POSITION TO 1 APRIL, 1967—TOTALS

| | England | Wales | Scotland |
|---|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation | 44 | — | 1 |
| *Acres*, 3,400 | | | |
| *Premises*, 41,060 | | | |
| **Smoke Control Areas in Operation** | 2,048 | 5 | 78 |
| *Acres* | 488,159 | 418 | 34,796 |
| *Premises* | 2,669,813 | 2,352 | 203,365 |
| **Smoke Control Orders** | | | |
| *Confirmed* | 319 | — | 23 |
| *Submitted* | 96 | 1 | 6 |
| **Grand Totals** | 2,507 | 6 | 108 |

*The lists below are supplementary to the information in the last issue of "Smokeless Air" (Spring 1967) which gave the position up to 1 January, 1967. They now show changes and additions to 1 April, 1967.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.*

## ENGLAND

### NEW SMOKE CONTROL AREAS IN OPERATION

**Northern**

Hartlepool B. No. 2.

**Yorkshire**

*West Riding (North)*

Rothwell U.D. No. 10.

**North Western**

*South Lancashire and North-East Cheshire*

Urmston U.D. No. 8.

### NEW ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*

Hebburn U.D. No. 7. Longbenton U.D. No. 1. Newburn U.D. Nos. 7 and 8. Tynemouth C.B. Nos. 3, 5 and 6.

*Teeside*

Thornaby-on-Tees B. No. 3. West Hartlepool C.B. No. 6.

**Yorkshire**

*West Riding (North)*

Aireborough U.D. No. 21. Batley B. No. 6. Heckmondwike U.D. No. 6. *Leeds C.B. No. 57. Leeds C.B. Nos. 60, 61, 62 and 63. Mirfield U.D. No. 8. Normanton U.D. No. 1. Ossett B. Nos. 10 and 11. Pontefract B. Nos. 3, 4, 5, 6, 7 and 8. Pudsey B. (Farsley South No. 5). Spenborough B. No. 8. Stanley U.D. No. 1. Wakefield C.B. Flanshaw No. 1.

*West Riding (South)*

Darton U.D. Nos. 6, 7, 8 and 9. Dearne U.D. No. 1. Sheffield C.B. No. 13. Wath-Upon-Dearne U.D. No. 3.

**North Western**

*South Lancashire and North-East Cheshire*

Altrincham B. No. 6. Atherton U.D. No. 3. Bolton C.B. (Halliwell and Smithills). Chadderton U.D. No. 8. Cheadle and Gatley U.D. No. 9A. Failsworth U.D. No. 6. Heywood B. No. 7.

*Leigh B. Nos. 4 and 6. Middleton B. (Langley No. 10B). Radcliffe B. No. 4. *Rochdale C.B. (Healey and Syke). Stretford B. No. 10. Urmston U.D. No. 6. Whitefield U.D. No. 7.

*Central Lancashire*

Accrington B. Nos. 1, 2, 3, 4 and 5. Burnley C.B. No. 9. Fulwood U.D. No. 1.

*Merseyside*

Birkenhead C.B. (No. 5 Upton).

**Midland**

*Derby, Nottingham and Chesterfield*

Beeston and Stapleford U.D. No. 8. Chesterfield R.D. No. 9. Derby C.B. Nos. 9 and 10. Dronfield U.D. No. 3. Ilkeston B. No. 2. Nottingham C.B. No. 8A. Staveley U.D. No. 1. Sutton-in-Ashfield U.D. Nos. 1 and 2.

*North Midlands*

Leicester C.B. No. 18.

*West Midlands*

Aldridge-Brownhills U.D. Nos. 24 and 25. Coventry B. Nos. 10, 11, 12, 13 and 14. Dudley C.B. Nos. 47 and 48. Halesowen B. No. 25. *Sedgley U.D. No. 9. Solihull C.B. Nos. 11, 12 and 13. Stourbridge B. No. 25. Sutton Coldfield B. No. 8.

*Potteries*

Kidsgrove U.D. Nos. 12 and 13. Stoke-on-Trent C.B. No. 16.

**London**

*Greater London Boroughs*

Brent L.B. No. 3. Camden L.B. (St. Pancras No. 8). Camden L.B. (Hampstead No. 9). Camden L.B. (Hampstead No. 10). Ealing L.B. Nos. 28 and 29. Hackney L.B. No. 11. Harrow L.B. No. 13. Havering L.B. No. 3. Hillingdon L.B. No. 6. Hounslow L.B. (Feltham No. 7). Hounslow L.B. (Brentford and Chiswick No. 8). Hounslow L.B. (Heston and Isleworth No. 11). Islington L.B. Nos. 24 and 25. Kensington and Chelsea L.B. (Redcliffe and Brompton). Lewisham L.B. No. 23. Merton L.B. No. 5. Newham L.B. No. 4. Richmond-upon-Thames L.B. (Twickenham No. 6). Sutton L.B. No. 16. Tower Hamlets L.B. Nos. 1 and 7 (Stepney Area). Tower Hamlets L.B. No. 2.

**Local Authorities outside the Black Areas**

Basildon U.D. Nos. 5 and 6. Hazel Grove and Bramhall U.D. No. 2. High Wycombe B. No. 14. Luton C.B. No. 5. *Meriden R.D. No. 1. Potters Bar U.D. No. 2. Rugby No. 6. *Scunthorpe B No. 6. Skelmersdale U.D. No. 2. Staines U.D. No. 8. Waltham Holy Cross U.D. No. 1. Whiston R.D. No. 1.

## NEW ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Tyneside and Wearside*

Boldon U.D. Nos. 1, 2 and 3.

*Teeside*

Billingham U.D. No. 5. West Hartlepool C.B. No. 7.

**Yorkshire**

*West Riding (North)*

Baildon U.D. No. 9. Brighouse B. (Bridge End No. 1). Elland U.D. Greetland No. 2. Halifax C.B. No. 14. Leeds C.B. Nos. 64 and 65. *Queensbury and Shelf U.D. No. 6.

*West Riding (South)*

Sheffield C.B. No. 4 (Sharrow/Moor).

**North Western**

*South Lancashire and North-East Cheshire*

*Bury C.B. No. 6. Crompton U.D. No. 4. Farnworth U.D. No. 2. Manchester C.B. (Burnage). Oldham C.B. Nos. 10, 11, 12, 13 and 14. Prestwich B. No. 7B. Rochdale C.B. (Falinge and Spotland). Royton U.D. (Thornham No. 3). Sale B. No. 8. Salford C.B. Nos. 12 and 13.

*Central Lancashire*

Blackburn C.B. No. 7. Brierfield U.D. No. 2. Colne B. No. 5. *Preston C.B. No. 17. Preston C.B. Nos. 18, 19 and 20.

*Merseyside*

St. Helens C.B. No. 5. Widnes B. No. 7.

**Midlands**

*Derby, Nottingham and Chesterfield*

Carlton U.D. No. 2. Derby C.B. Nos. 11 and 12. Long Eaton U.D. (Lower Brook Street, No. 1). Long Eaton U.D. (Wimpey's Eastate No. 1). Sutton-in-Ashfield U.D. Nos. 2 and 3.

*West Midlands*

Bedworth U.D. No. 1. Birmingham C.B. Nos. 88, 113, 139-143. Coventry B. No. 9. Dudley C.B. Nos. 49 and 51. Dudley C.B. (Brierley Hill Area Nos. 27 and 28). Sutton Coldfield B. No. 9.

**London**

*Greater London Boroughs*

Brent L.B. No. 4. Bromley L.B. Nos. 4, 5 and 6. Croydon L.B. No. 9. Ealing L.B. No. 30. Haringey L.B. (Tottenham No. 7). Haringey L.B. (Wood Green No. 10). Haringey L.B. (Hornsey No. 9). Harrow L.B. No. 14. Lewisham L.B. No. 24. Merton L.B. No. 6. Southwark L.B. Nos. 19-22.

*Outer London*

Dartford B. (Temple Hill South). Dartford B. No. 6.

**Local Authorities outside the Black Areas**

Brentwood U.D. No. 6. Crewe B. No. 4. Exeter C.B. (Whipton No. 1). Exeter C.B. (Stoke Hill No. 2). Exeter C.B. (Cowick Lane No. 3). Exeter C.B. (Carlyon Gardens). Grantham B. No. 12. Hemel Hempstead B. (Chaulden No. 1). *Lancaster C.B. No. 4. Oxford C.B. No. 6. *Ramsbottom U.D. No. 1. Reading C.B. No. 11. Rochester B. No. 4. Rugby B. No. 7. Watford B. No. 7. Whitley Bay B. No. 3.

## SCOTLAND

### New Smoke Control Orders Confirmed but not yet in Operation

Barrhead No. 2 (Auchenback). Coatbridge (Rosehall and Whifflet). Dumbarton Burgh (Nos. 6, 7 and 8).

### New Smoke Control Orders Submitted but not yet Confirmed

Coatbridge (Townhead). Stirling County (Carron, Carronshore and Skinflats).

## NORTHERN IRELAND

### New Smoke Control Area in Operation

Dundonald R.D. (Castlereagh) No. 1.

## SUMMARY OF SMOKE CONTROL PROGRESS

**As at 1st April 1967**

| (1) *Region* | (2) *No of acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage of total black area acreage in region so covered* | (4) *No. of premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage of total black area premises in the region* |
|---|---|---|---|---|
| Northern . . | 21,690 | 17·3 | 100,975 | 18·26 |
| Yorkshire and Humberside . . | 118,920 | 31·6 | 402,855 | 34·5 |
| East Midlands . . | 35,655 | 13·28 | 120,495 | 23·54 |
| Greater London . . | 179,210 | 54·8 | 1,600,925 | 64·04 |
| North Western . . | 120,600 | 30·06 | 565,850 | 33·23 |
| West Midlands . . | 62,455 | 25·08 | 267,315 | 25·41 |
| South Western . . | 5,050 | 19·17 | 18,105 | 12·15 |
| Totals (black areas) | 543,580 | 30·6 | 3,076,520 | 39·56 |
| Outside black areas (all parts) . . | 94,306 | | 329,897 | |
| Grand Totals . . | 637,886 | | 3,406,417 | |

The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of a black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country).

*Note*

Statistics in respect of Wales and Monmouthshire are no longer included.

*Orders withdrawn*

Bexley No. 2. Blaydon No. 3. Crompton No. 3. Stockton on Tees No. 1. Whickham No. 1.

# DISTRICT HEATING

## London Symposium

DELEGATES crowding Church House, Westminster, on 21 March, 1967, were addressed by Reginald Freeson, M.P. (Parliamentary Secretary, Ministry of Power) who officially opened the two-day Symposium on District Heating organized by the Institution of Heating and Ventilating Engineers.

Making his maiden speech as Junior Minister in public, Mr. Freeson stressed that he was not only concerned with the efficient use of fuel but in creating conditions in which people could live richer and more varied lives, work better, and so add to our prosperity. There was in this country the trend for demanding better heating conditions, but he wondered whether these needs were being met. Why had district heating been slow to start in this country? "It is" said Mr. Freeson, "the purpose of this Conference to take a long, cool look at the whole subject to assess what factors are in favour of district heating, what factors are holding it up, or capable of adjustment and improvement, what is the impact of technological change, and how our progress in this field compares with that in other countries".

Mr. Freeson referred to existing examples of district heating schemes in Britain but said that we had certainly not advanced in this respect as much as a number of other countries in Western Europe. Because of various modern techniques, a much better return could now be obtained for a given outlay, for the provision of heating systems. "The Clean Air Policy" said Mr. Freeson, "which has been under way for quite a number of years now, has provided, and continues to provide, the environment which positively encourages proposals for district heating".

Turning to the future of new building developments, Mr. Freeson stressed the importance of considering energy requirements as a whole and of making this one of the first considerations in design. There was the need of integrating planning with various human needs at a very early stage indeed and now there were new organizations set up at national level to meet this demand. He also stressed that in planning the heating of new housing developments, it was not enough to consider capital costs. The subsequent running costs were also most relevant. That was why the new cost control arrangements to be introduced by the Ministry of Housing and Local Government would take cost in use into account in determining the total expenditure on district heating schemes eligible for loan sanctions. "When all the economics" concluded Mr. Freeson "and all the techniques of administration and all the technological methods have been worked out and applied, the objective is to provide a richer and more attractive environment, internally and externally, in our cities, the new and the old, and anything we can do in this direction, no matter how long and how difficult our task, is certainly worthwhile."

With Lord Robens in the Chair, Sir Donald Gibson, C.B.E., D.C.L., (Director General of Research and Development, Ministry of Public Building and Works) gave the Opening Address. He said that the justification of district heating was getting stronger because of higher building densities and a general requirement for higher heating standards; also there were vast opportunities in the expansion of our population by some extra 20 million people. We needed a policy of new towns and cities in Britain if the use of district heating was to be used on a desirably large scale. It was less likely to be adopted in the more general expanding old towns. Sir Donald described the early attempts at district heating in Coventry. These led to a feasibility study upon the proposed new city in Buckinghamshire, which showed that every family living there could save 30 per cent of their fuel bill.

Sir Donald Gibson thought there would be advantages in charging a flat rate for hot water and heating rather than metering. The new study being undertaken with the Ministry of Public Building and Works and the Statutory Supply Authorities should help to support the best methods of heat distribution. After describing a project to sink a new road and service tunnel in the River Thames, Sir Donald concluded by urging for a greater investment of research effort to secure a better environment for our children.

### Air Pollution and District Heating

"Urban Air Pollution and District Heating as an Aid to its Prevention" was the title of the paper presented to the Symposium by Arnold Marsh, (Director of the National Society for Clean Air) who stated that the most considerable source of pollution today was that from the domestic open fire using raw bituminous coal, and it was that fact that made appropriate a contribution on the air pollution factor in the present district heating symposium.

After discussing the major pollutants smoke, grit and dust and sulphur dioxide, Mr. Marsh also mentioned briefly other forms of pollution, with special reference to the constituents of exhaust emissions. Outlining the ill-effects of air pollution, he stressed the health effects and had this to say about costs of dirty air: "These costs, in terms of material and labour, are completely non-productive, and are a sheer waste of national resources. This is a convenient point to emphasize that any practicable measures to reduce pollution—with special reference to domestic pollution—are unlikely to be more than a small fraction of the continuing cost of failing to take adequate action."

Surveying progress, Mr. Marsh said that industrial pollution was in general being reduced, partly because of the Clean Air Act, and domestic pollution was also being reduced, although too slowly, by the establishment of smoke control areas. Giving figures for smoke control progress in various regions of the country, he stated: "These figures show again that the best progress is being made in the Greater London area, and that the north and midlands have a long way to go before full smokelessness is attained. It is therefore these areas that should be interested in the possibilities of district heating".

Discussing domestic heating trends, Mr. Marsh pointed out that rising standards were being met by smokeless methods. "It may be anticipated" he said, "that what is in effect a major heating revolution will continue to develop and to spread steadily from the south to the north". Gas, electricity and oil had important contributions to make, but there would continue to be a substantial market for solid fuel.

*Centralized Heat.* Mr. Marsh compared district heating's relation to air pollution to that of electricity generation. "In both cases the fuel may be coal or oil, which will be burned far more efficiently than in individual installations. Smokeless operation can be assured, and if the chimneys are sufficiently high, in relation to the fuel consumed, the sulphur gases will have minimal ill-effects, and the emissions from large numbers of low-level sources can be eliminated". Mr. Marsh quoted examples from Denmark and said that the economics of district heating called for high-density population and in such areas centralized heating could notably help to promote clean air. "In addition to requiring a sufficiently high chimney, care would have to be taken with the siting of the heat plant in relation to the housing it would have to serve, with special attention to the effects on, and of, high blocks of flats. These requirements would have to over-ride town-planning and landscaping development that might, as is sometimes the case, not favour high chimneys".

The air pollution factor is, of course, only one among many that need to be considered in assessing the contribution that district heating might make to both existing or new housing, and to commercial areas. In areas of existing houses it could perhaps play an important part in promoting clean air in the north and midlands; in the south it would appear to have most promise in new towns and other housing developments."

## Hypothermia

In an interesting paper on *Hypothermia—Low Body Temperature*, Dr. Geoffrey Taylor told the delegates that recent research had shown that the human heat regulating mechanism was less efficient than had been thought. "Because of the newly found association of cold with illness and deaths" he said, *British Medical Journal* in dealing with hypothermia used the headlines 'Deadly Cold' and 'Cold the Killer'. The further recognition that a slightly lowered body temperature is uncomfortable and a greater lowering dangerous or even fatal, has far reaching implications in medicine, architecture, factories and houses, methods of heating and in the vast extra need for efficient and cheap heat, involving national decisions on fuel and housing policies".

Dr. Taylor described the connection of low body temperature with disease and mortality rates. From studying deaths associated with hypothermia in small Somerset towns he deduced that if these figures were related to the population of England and Wales, a death rate of between 20,000 and 100,000 yearly was indicated. A Lloyd's Insurance firm, as a result of the relationship of cold with death rates, was offering life insurance with a 10 per cent reduction in premium to people living in centrally heated houses. Lowered body temperature also had definite effects on mental and physical efficiency.

Dr. Taylor described some experiments he had made, showing the effects on people's bodies of the loss of heat by radiation through cold window glass. "More detailed work" he stated, "is needed on the type of gas, oil and electric fires, the total amount of heat they give out, their position in relation to the human body, the localisation and spread of their heat as well as the optimum temperature from central heating and the heat loss from radiation through glass and by draughts".

Dr. Taylor said that we had to focus public attention on the vast need for more heat and a complete review of present housing, heating and insulation methods. If district heating would provide heat at half the present price of other methods in Britain, it should be considered at once nationally.

Suggesting that the conference should take steps to set up a university professorship to study human environment and human ecology, Dr. Taylor concluded: "I suggest one of the first jobs of this university department should be to study new buildings and new towns, their comfort, warmth and ventilation, to bridge the alarming gulf between what is possible and is needed, and the conditions in which people actually live.

"There are overwhelming economic reasons for these studies. When we recognize many old people will die of cold this winter in Britain, there is no possible excuse for further delay.

"The Ministry of Health should issue a Report laying down minimum standards for house heating, including heating of bedrooms to at least 55/60°F with capacity for heating to 65 or 70°F when required by occupants."

## National Economics

Dr. Albert Parker presenting his paper *National Economics and Fuel and Energy Consumption*, reviewed the world energy resources and energy consumption, with special references to the situation in the United Kingdom.

Assuming that the coal equivalent of all the energy used in this country in 1965 for space heating and hot water was in the region of 100 to 200 m. tons of coal equivalent, Dr. Parker wondered what part of the heating by this amount could with advantage be done by systems of district heating. "Subject to reasonable overall costs" he said, "including capital, maintenance, fuel, and labour charges, and taking into account any advantages of cleanliness and convenience, there is scope for schemes of district heating in areas with a high density of houses or apartments and other buildings, including offices and factories for light industry. In this country, where the demand for space heating and hot water is much higher in the winter period than at other times of the year and there is little or no demand for cooling in the summer, it would seem that a combination of electricity generation with back-pressure turbines for hot water for space heating is unlikely to be economic. Central boilers planned for the high winter loads and low summer loads, and using fuels that can easily be stored would seem to be the most suitable for this country".

### Legal Aspects

Mr. C. Hardinge Pritchard in a paper *Legal and Parliamentary Aspects* mentioned the various local Acts up to 1960, which included district heating provisions in their powers. Because the existing district heating schemes had not proved unqualified successes, the Ministry of Housing and Local Government did not grant district heating powers in the subsequent six years. In 1966, however, there was a change of attitude on the part of the Ministry with regard to district heating proposals, due to the trend towards building at higher densities, the growing demand for better standards of comfort and technological advances. "Other matters which had influenced the Ministry" stated Mr. Pritchard, "were the requirements of the Clean Air Act, 1956 and the higher domestic heating standards recommended by the Parker Morris Committee in their report *Homes for Today and Tomorrow*. In view of all these developments the Minister had expressed the belief that district heating schemes which could be shown to be practicable and economical deserved sympathetic consideration. He was satisfied that such schemes could be formulated, and he was also confident that he could exercise control over them by means of loan sanction".

After discussing the need for local Act powers and describing the details of district heating provisions with and without special powers, and the acquisition of land by Corporations, Mr. Pritchard said: "I see no good reason why persons of bodies other than local authorities should not be empowered to supply heat, certainly from the legal point of view. The most obvious examples would be the coal, gas and electricity industries in so far as their respective Acts permit them to engage in such activities."

In conclusion Mr. Pritchard considered what could be done in the future to simplify the procedure and make it more easy to obtain powers of providing district heating.

### Financial Aspects

In a paper on this subject, Hugh H. H. Halby stressed the importance of raising the necessary capital finance, since district heating was not in itself a Public Utility. He reviewed the possible sponsors or operators of such schemes and stated that "District Heating is still fairly new in this country and largely an unknown quantity so far as the financial world is concerned. Unless, therefore, the project is underwritten by a sponsor with a solid financial standing in its own right, the chances of being able to float a loan on the Stock Market is improbable but it might be possible to negotiate a long-term loan privately with institutional investors."

On the financial aspects of metering and charging for district heating, the author outlined the arguments in favour of meters or a fixed charge, and discussed the profit element. He concluded by suggesting possible improvements in methods of raising finance and mentioned the practices employed for this on the Continent.

### Methods

Low cost fuel was essential in order to pay for the network. This was the theme of R. M. E. Diamant's paper *Methods of Centralized Heat Generation.* All sources of energy should be examined; including waste heat from industrial processes, electricity generation and refuse incineration. The latter, considered only as a fuel, would cost more than conventional fuels and must be thought of as beneficial side product of refuse destruction. Transmission costs of energy depended on the medium. To transmit 1,000 therms a distance of 10 miles, the costs would be as follows: oil 47s., gas 65s., hot water using the Russian single-pipe system 100s., or 117s., using the two-pipe system. Electricity was the most expensive of all at 177s.

Mr. Diamant said that heat at present wasted in generating plant could be reclaimed using the I.T.O.C. (Intermediate Take-Off Condensing) turbine where steam during low-demand periods is by-passed to thermal accumulators. "When heat is abstracted" said Mr. Diamant, the loss in electricity generating capacity is so slight that one is almost justified in saying that the plant converts fuel into heat at around 400–500 per cent efficiency". Gas turbines had great possibilities in district heating providing they were combined with exhaust-gas heat exchangers.

In conclusion he said: "The rebuilding of British cities is giving us a chance to install a municipal network far cheaper than it will be possible to do when the cities have been rebuilt. It is a chance which we must not miss. Our national economy will depend upon it, now that fully heated homes are demanded by the occupants and urged by the Government. In two decades time there will be 25 m. fully centrally heated homes instead of the 2½ m. or so today. Centralized heat generation is the only way to use coal, oil, gas and nuclear energy in the most economical way, and at the same time solve our considerable problems of how to dispose the increasing quantities of urban refuse, and maintain a clean and healthy environment."

### District Heating on the Continent—France

"Twenty years ago there was not much district heating in France" said P. C. Hawkins. Post-war France, however, had an acute housing shortage and the number of blocks of flats constructed each year was twice as many as the number of individual dwellings. Coal would be used less as a fuel and oil and gas usage would increase. The idea of heat service companies originated in France and out of the total operated load of all companies, only 12 per cent was in district heating. Local authorities were safeguarded by the heat service company who not only had to design and build the heating but had to guarantee it over 20 or 30 years. Mr. Hawkins outlined the legal, administrative and financial aspects involved in this. Generally, in France, flat rate tariffs were used instead of heat metering. The viability of a district heating system was basically related to heat density, which had to be at least 6,000 Btu/h ft of network. Temperatures inside dwellings were similar to those used in the U.K. and the most favoured appliance was the radiator, which had the lowest operating cost and gave the best heat distribution.

### Scandinavia

The Danish consultant, F. E. Olsen, outlined the progress of district heating in Scandinavia. Denmark, he said, had at present six combined heat power stations and 400 district heating stations, the latter having a total annual output of 16 m. Btu. All large cities had their own district heating plants. Norway had no district heating as such, and Sweden, which had no district heating before 1950, now had installations in sixteen towns. In spite of this late start in district heating, Sweden had more centrally-heated dwellings than Denmark. The rate of growth of central heating in Denmark was 4 per cent per annum, half of this from new buildings.

Mr. Olsen described the most used types of district heating system in Denmark, the financial arrangements and technical details of Danish practice. It was important to realize, he said, that the economy of the district heating schemes in Denmark resulted mainly from the low price of fuel oil, £5 per ton compared with £10 per ton for coke. Allocation of charges was based on evaporative heat meters. Mr. Olsen also underlined the advantages of refuse incineration combined with heat generation. It was expected, he said, that Denmark during the next 20 years would invest 7 to 9 m. pounds per year in district heating plants, not counting the cost of the internal installations which were considered as part of the building costs.

### District Heating in the U.K.

Engineers in this country have been faced, not with a shortage of technical knowledge, but with a threadbare budget, and only barely minimum standards of heating. This was the argument put forward by G. A. Rooley in his paper *District Heating in Great Britain.* Engineers should not forget that the justification of a district heating scheme rested on fuel economy; if fuel could be piped more cheaply to dwellings than hot water, it might be a case for de-centralization and not centralization by district heating. Mr. Rooley said that a vendor of heat was necessary, if district heating was to develop to any extent. To some degree this was being done by the National Coal Board and the oil companies, who would provide capital for the station and network. There were also consortia of contractors. Generally, Mr. Rooley thought, that compared with the immediate post-war years, there was a great deal more confidence in district heating design and facilities. "It would appear" he said, "that this Symposium marks the beginning of a new era. Developers and designers are, as it were, poised on the launching pad with the confidence of all these assets."

*Review*

## INHALED PARTICLES

**Inhaled Particles and Vapours II. Edited by C. N. Davies. pp. 605. Pergamon Press, Oxford. £7 net.**

The British Occupational Health Society held an important symposium in 1960 on this subject, the Proceedings of which were subsequently published under the title "Inhaled Particles and Vapours I" (Pergamon Press, 1961, £5). In 1965 a second symposium was held, the Proceedings of which have just been issued.

The new volume is a worthy companion to its predecessor, both in the value of its contents and the quality of its production. It contains a further 48 papers. They are of a specialized nature and do not lend themselves to any generalized comment; except to say that they bring together in one volume a vast amount of medical and other information in a way that will be welcomed by workers and students in a number of related fields.

The scope of the volume can be indicated by listing the sections into which the papers are grouped. Under Anatomy and Physiology are sections on the pulmonary response to dust—airway changes, reactions to silica, and miscellaneous. Then there are sections on lung clearance in animals, deposition and clearance in man, and dust in human lungs; the relationship in pneumoconiosis of dust to response, and finally evaluation of dust exposure. A useful critical review of the subject, as illuminated by the papers, is given in the form of a preface by the Editor, Dr. C. N. Davies.

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### Footnote to Parker Morris

*Mrs. Rose O'Mara, a barmaid from Walworth: "I don't think we should put central heating in Council houses. I am a council tenant and I would not want it. I don't think there is anything nicer than going into a cold bedroom.—* Evening News.

# *News from the Divisions*

## North West

The Annual General Meeting of the North West Division of the Society was held on 12 April, 1967, when members met at the Electricity Council's Research Laboratories at Capenhurst, near Chester. On arrival, Dr. Trevor Churchman, Director, gave a short address of welcome to members who were escorted on conducted tours round the Research Centre.

Dr. Churchman said that he was very pleased to have the members of the Society hold their annual meeting at Capenhurst, an appropriate place when one thought that the utilization of electrical energy was a certain way of achieving clean air. He mentioned a prototype model of an electric car which in time would no doubt contribute very largely to the clean air campaign by its replacement of the present 'infernal' combustion engine, and went on to speak of the Electricity Authority's general contribution to clean air, especially as applied to the modern nuclear power stations. He said that the Industry spent many thousands of pounds each year on restricting the flow of polluted air from power station chimneys and explained the role of the Council's Research Establishments to find ways of increasing the efficiency of our generating plant to meet the ever-increasing demand for power. Dr. Churchman concluded his remarks with a reference to the concept of an all-electric town. After the tour of the Centre members were entertained to lunch by the Board and then the Annual General Meeting of the Division was held.

## North East

The Annual Meeting of the Division was held at Norgas House, Killingworth, on 20 April, 1967. Members were welcomed by Dr. J. Burns, C.B.E., of the Northern Gas Board and immediately embarked upon a tour of Norgas House. After a film show in the auditorium members were taken by coach to the Banqueting Rooms, Gosforth Park, to be entertained for lunch by kind invitation of the Board.

*Miss Kenyon, the new Chairman of the North West Division, with A. Taylor, Immediate Past-Chairman*

During the meeting that followed a symposium on "Gas and Clean Air" was delivered by W. E. Bouch, B.SC., the Board's Development Engineer, and A. S. Middleton, B.COMM., the Commercial Manager. Their subjects were "From Coal Gas to Natural Gas" and "Gas Today and Tomorrow and its Effect on Clean Air". A stimulating question and discussion period followed and the business of the meeting concluded with a vote of thanks to the speakers and the Board while members were taking tea prior to their return by coach to Newcastle.

## Yorkshire

The Division held a Council Meeting in the Conference Room of the North Eastern Gas Board, Mill Street, Bradford, on Monday, 8 May, when J. Baxendale, the Group General Manager, welcomed members to the Group Office and entertained them to a luncheon. An Open Meeting to consider the increasing pollution of the air by motor vehicles took place in the afternoon. Members of the Division listened to a thoughtful address by B. H. Croft, A.M.I.MECH.E., D.C.AE., Chief Development Engineer of Brico Engineering Ltd. of Coventry on the A.E. Petrol Injection System and its control of automotive exhaust emissions.

Council had met at the Viceroy Works of Universal Machinery and Services.

After a heavy agenda had been dealt with L. Barnett, the Managing Director, welcomed Council members and gave a talk on Smokeless Incineration in which he explained the progression of experiments that had culminated in the efficient incinerators now produced by the Company. He called for a 'concerted attack' to eliminate air pollution and expressed gratitude to the Society for undertaking research into the elimination of road vehicle fumes.

Following luncheon as the guests of Universal Machinery, Mr Barnett and his fellow Directors, gave a demonstration of the smokeless disposal of various forms of refuse on the larger incinerators manufactured by the Company. At the conclusion of this very interesting exercise the Chairman of the Division thanked Mr. Barnett and his fellow Directors for providing the facilities for the visit and for entertaining members to lunch. During the meeting E. J. Winfield, Chief Public Health Inspector for Castleford and Vice-Chairman of the Division, had emphasized the importance of Health Officers being in a position to give advice on the disposal of waste, especially as they were being increasingly called upon to do so.

## East Midlands

By invitation of the East Midlands Gas Board, a meeting of the Division held on 16 March, took place in the Victoria Hotel, Nottingham.

A working lunch was provided during which L. F. Randall, Commercial Manager of the Board, welcomed the members and delegates. Councillor W. Everett, Chairman of the East Midlands Division of the Society thanked Mr. Randall and the East Midlands Gas Board for the excellent arrangements and for the hospitality.

Dr. F. J. Eaton, Adviser on Clean Air to the Gas Council, presented a paper entitled "Natural Gas and Clean Air". Arnold Marsh, Director and Secretary of the Society opened the discussion on the paper.

Thanks were expressed by J. Edwards, Deputy Chairman of the Division, to Dr. Eaton for his paper, to those who had taken part in the discussion, and to Mr. Leaman, Coke and By-Products Manager, East Midlands Gas Board, who had made the detailed arrangements of the meeting.

## South East

On 1 March, 1967, the Caxton Hall, Victoria Street, London, S.W.1, was well filled for a discussion on "Some New Thoughts on Smoke Control". T. Steel, Chief Public Health Inspector of Crawley New Town, in opening the discussion posed the questions: "Should all new housing estates be smokeless and preferably all electric from the start?—What are the New Towns doing about Smoke Control?—Are the white areas really white?—Has the time come to re-appraise the

*At the A.G.M. of the West Midlands Division, held at the headquarters of the West Midlands Gas Board, on 19 April. L. to R.: Ald. R. L. Pritchard, Vice-Chairman; The Mayor of Warley, Cllr. W. Carter, J.P.; Cllr. F. V. Magness, C.B.E., Chairman; W. L. Kay, Hon. Secretary; and A. Gray, Area Sales Manager, West Midlands Gas Board* black areas?—Should smoke control be mandatory in urban areas?"

He mentioned that after 11 years only one quarter to a third of designated smoke control areas are in operation in the South East.

Dr. S. R. Craxford spoke on the need for proper siting of industry and emitting of sulphur dioxide at high levels in proper town planning. Although it had a bad start in this country District Heating was flourishing in Denmark. New housing development in the south of England must embrace refined ways of heating and design.

A lengthy discussion followed and the economic value and viability of all smokeless fuels was stressed.

### Scottish

The annual conference of the Scottish Division was being held as we went to press. Held at Ayr, on 17 to 19 May, the programme included on the Thursday morning addresses on "Must we have Unclean Air", by Dr. W. A. Horne, until recently Medical Officer of Health for Glasgow, and on "The Financial Implications of the Clean Air Act", by John Nelson, Town Chamberlain, Dumbarton. On the Friday morning there were papers on "Progress in Industrial Pollution Control", by Dr. E. A. B. Birse, Chief Alkali Inspector for Scotland, on "Pollution from Motor Vehicles", by Dr. L. E. Reed of the Warren Spring Laboratory, and "Industrial Chimneys for Oil Fired Plant", by G. Knox, of Shell Mex and B.P. Scotland Ltd. On the Thursday afternoon visits were made to the Hunterston Nuclear Power Station, and to ceiling heated houses at Ardeer. The conference was opened by the Provost of Ayr, who was also host at a luncheon to the delegates on the Thursday. He was the chief guest at a luncheon given by the Division on the Friday, presided over by the President of the Division, John Foreman. At the close of the luncheon a report from the National Society was given by Arnold Marsh.

### South Wales and Monmouthshire

After something of an interregnum the Division has resumed activities, and a successful meeting was held on 3 May last. This included a visit to the works of South Wales Switchgear, Blackwood, where the company entertained those present to lunch. A new committee has been formed and a planned programme for future meetings is being drawn up. The new Hon. Secretary of the Division is L. Morgan, of Port Talbot.

*The Society's Stand at the recent Royal Society of Health Exhibition at Eastbourne*

# Air Pollution Abstracts

**985. The Performance of Positive Crankcase Ventilation Systems on Automobiles in Cincinnati, Ohio: Report No. 2.** Coté W. A. (J. Air Poll. Cont. Ass., March 1967, **17** No. 3, 139). In January 1966, 483 randomly selected 1963–1966 model automobiles were inspected at the Cincinnati Vehicle Inspection Station to determine the effectiveness of their positive crankcase ventilation systems. All of these automobiles should have had crankcase ventilation systems installed in accord with the voluntary programme of the automobile manufacturers. However, 48 of the automobiles inspected had no positive crankcase ventilation system. In addition, 27 cars were equipped with systems which could not readily be tested. Testing of the remaining 408 cars was performed with a combination pressure-vacuum gauge designed to measure the airflow in the crankcase. Results showed that 71 per cent of the positive crankcase ventilation systems tested were operating satisfactorily and impending maintenance of systems was indicated for 29 per cent of the automobiles tested. Although the systems of certain makes of cars performed considerably better than others, a definite decrease in system performance with increasing age and mileage was observed for the cars tested. The performance data indicate that the periodic maintenance required for positive crankcase ventilation systems is not being implemented. Only 47.5 per cent of the drivers questioned were aware of the system and only 10 per cent knew whether their system had been serviced.

**986. Substantiating the Maximum Permissible Daily Average Concentration of Carbon Monoxide in the Atmospheric Air.** Shul'ga T. M. (Hygiene and Sanitation, April–June 1965, **30**, Nos. 4–6, P.1–5). The work was aimed at obtaining experimental data to substantiate the existing standard value of the daily average concentration of carbon monoxide in the atmospheric air at the level of 1 per cent mg/m$^3$. Around-the-clock poisoning of albino rats with carbon monoxide gas at average concentrations of 2.65 and 1.13 mg/m$^3$ was carried out for a period of 2½ months. The investigations performed showed that carbon monoxide at an average concentration of 1.13 mg/m$^3$ produced no changes in the motor chronaxie, the porphyrin metabolism and had no effect on the functioning of the blood forming systems. Consequently, the existing daily average maximum permissible concentration of carbon monoxide in the atmospheric air at a level of 1.0 mg/m$^3$ is experimentally substantiated.

**987. Effect of Air Polluted with Sulphur Dioxide and Nitrogen Oxides.** Petr B. and Schmidt P. (Hygiene and Sanitation, July–Sept. 1966. **31**, Nos. 7–9, 111–120.)
1. Atmospheric pollution by sulphur dioxide and nitrogen oxides has a significant effect on the state of health of children residing in this environment for longer periods.

The stay in an environment polluted by a mixture of both pollutants has more serious effects than a stay in an environment polluted mainly by one of them ($SO_2$), provided the ratio of the two substances is 1:1.

2. The combined chronic effect of sulphur dioxide and nitrogen oxides is as follows: if the nitrogen oxides are present in excess over the concentration of sulphur dioxide, the effect of the mixture is potentiated.

If the concentration of sulphur dioxide is higher with respect to that of nitrous gases, the effects of the two mixture constituents are mutually neutralized and the effect of the mixture is attenuated.

3. Preventive measures should take the form of the removal of both health hazards or the decrease of their concentration below the maximum permissible level. If this measure cannot be carried out, then a temporary arrangement recommended is the frequent sending of the children to recreation centres outside the boundaries of the polluted territory, as well as the following of a suitable nutrition regimen.

**988. Carcinogenic Effect of Asbestos Dust.** Kogan, F. M. Troitskii S. Yu. and Gulevskaya M. R. (Hygiene and Sanitation, July–Sept. 1966, **31**, Nos. 7–9, 218–224).
1. For the last 10 years, the mortality due to lung cancer has been considerably

higher among workers at asbestos-dressing factories and asbestos mines in a certain town, especially among women, than in the remaining population in the same town and region.

2. Most of the deaths occurred among persons over 40 who were employed for 5 to 36 years (average, 20 years) in a dust-containing air environment.

3. Lung cancer was the cause of death in 9 per cent of asbestos patients, the mean age of the victims at death being 57 years, while their mean "asbestos" employment was 20 years.

4. Apart from lung cancer, asbestosis patients ($\frac{1}{3}$ of cases) often died from cancer of extrapulmonary localization.

5. In the case of persons employed in the asbestos industry for a prolonged time, lung cancer should be regarded as an occupational disease, with all the attendant medical and social consequences.

**989. Analysis of the Atmosphere for Light Hydrocarbons.** Stephens E. R. and Burleson F. R. (J. Air Poll. Cont. Ass., March 1967, **17,** No. 3, 147). A procedure has been developed for the analysis of trace quantities of light hydrocarbons in air. A freeze-trap filled with chromatographic packing was installed in place of the gas sample loop of a flame ionization chromatograph. An air sample 0.1–0.5 litre volume was passed through the trap which was chilled with liquid oxygen. The trap was then brought to ice temperature and its contents simultaneously swept into the column. The resulting chromatogram could be used to determine about 25 hydrocarbons through n-hexane. The minimum detectable concentration was below 1 ppb for these hydrocarbons. With such sensitivity it is possible to make useful measurements even on samples of light air pollution. Air samples from the Riverside area were analyzed in this fashion starting in the summer of 1965. The relative amounts of these hydrocarbons were then compared with the distribution reported for the various known hydrocarbon sources. The attenuation of the more reactive hydrocarbons by photolysis was also observed. A system for irradiating trapped air samples was also constructed. Samples were collected in 5-gallon borosilicate bottles which were then irradiated with ultraviolet radiation and the concentration changes followed.

**990. Recent Epidemiological Studies of Lung Cancer Mortality, Cigarette Smoking and Air Pollution, with discussion of a new Hypothesis of Causation.** Stocks P. (The British Journal of Cancer, 1966, Vol. **10,** pp. 595–622). 1. Simultaneous surveys of cigarette smoking and of the amounts of polycyclic hydrocarbons and trace elements in the air throughout a year have been made in 6 European cities and 2 areas of Wales. The results when correlated with the death rates from cancer of the lung and bronchus yielded substantial and independent relations with the smoking and air pollution indices.

2. When published data from nineteen countries of the consumption of cigarettes per adult and consumption of solid and liquid fuels per capita in various years were compared with the lung cancer and death rates notable correlations were found both with smoking and solid fuel but none with liquid fuel.

3. Analysis of the death rates from lung and stomach cancer and bronchitis since 1921 in conurbations of England compared with the surrounding region shows that after allowing for differences in social and other factors a large urban excess of long cancer remains which must be attributed to air pollution.

4. When lung cancer death rates in cohorts of men born since 1896 are matched with the numbers expected from a hypothesis that the cancer is started after a series of 5 cell changes which progressively add susceptible individuals to the population according to a probability formula, good agreement results if there is an average latent interval between initiation and death of 21 years in mid-life or rather less before 35 and after 55. If smoking and air pollution act by accelerating the final stages of growth in those susceptibles who have reached an advanced point in the latent interval, this would explain many observed facts which are not compatible with the current view that everyone is liable to lung cancer.

**991. The Influence of Moisture on the Adsorption of Atmospheric Sulphur Dioxide by Soil.** Terraglio, F. P. and Manganelli R. M. (Int. J. Air & Wat. Pollut., Nov./Dec. 1966. **11/12.** 783). Dry acid soils do not remove sulphur dioxide from the air but less acid soils can retain significant quantities of the gas. Moisture in soil increases the amount of sulphur dioxide that will be retained by soil, so all soils can be said to remove sulphur dioxide.

**992. Effect of Nitric Oxide, Nitrogen Dioxide, or Ozone on Blood Carboxyhemoglobin Concentration during low-level Carbon Monoxide Exposures.** Lutmer,

R. F. *al et.* (Atmospheric Environment, Vol. **1.** No. **1.** Jan. 1967. 45). Compared to exposure to CO alone, no enhancement of blood carboxyhemoglobin concentrations was observed following 7-hr exposures of rats and mice to low levels of CO plus NO, $NO_2$, or $O_3$.

**993. Smog: The Deadly Poisons Peril Life in all City Areas.** Chironis, N. P. (Product Engng., Dec. 1966, vol. **37**, 32–41). Discusses photochemical smog produced by exhaust gases from motor vehicles and its effect on vegetation and humans. Explains how the various pollutants are produced by motor vehicle engines and possible methods of control including control devices for the exhaust system, use of gas turbines, electric vehicles and nuclear power.

**994. Investigation of the Air Pollution and Ventilation of Garages, Automobile Repair Shops and Motor Running-in Plants.** (In Hungarian). Dobos, G. and Csányi, G. (Munkavédelem, Budapest, 1966. v. **12.** Nos. **1/3**, 33–36). Carbon monoxide, sulphur dioxide, acrolein and smoke were determined in different workshops where either petrol or diesel engines contaminated the air. It was found that of the possible air contaminants in relation to their MAC values the carbon monoxide concentration was the highest in the case of petrol engines and the smoke in the case of diesel engines. That means that in the former case the efficiency of the ventilation of the premises can be judged by measuring carbon monoxide in the air and in the latter case by measuring smoke concentration.

**995. Contribution of Burning of Agricultural Wastes to Photochemical Air Pollution.** Darley, E. F. *et al.* (J. Air Pollut. Control Ass., Dec. 1966, vol. **16**, 685–690). Agricultural wastes from orchards, grain fields, and range lands are burned in California as the most practical means of ridding the land of these wastes. In order to determine the relative contribution of the burning of such material to photochemical air pollution, the effluent from 123 fires of known weights of range brush, both dry and green, barley and rice stubble, and prunings from various fruit and nut trees were monitored in a special tower which provided an open burning situation. Analyses were made for total hydrocarbon, expressed as C, by flame ionization detection, and for 24 individual hydrocarbons by gas chromatography, as well as for CO and $CO_2$ by infrared spectroscopy. A few analyses were made for oxides of nitrogen. These data, coupled with temperature and airflow measurements, allowed calculations to be made on pounds of effluent per ton of material burned and demonstrated that the emissions from agricultural burning are much less than those from the automobile.

**996. A New Instrument for the Continuous Measurement of the Dust Content.** (In German) Weber, M. (Techn. Uberwach, 1966. **7**, 337–9). The new German laws on air pollution demand the installation of a dust measuring instrument on all solid fuel fired plants consuming more than 10 000 kcal/h. An instrument has been developed which uses the additional pressure drop during changes in velocity of dust-laden gas; the drop is a function of the dust content of the gas. The instrument has been tried out successfully in an industrial installation but its accuracy and response time have still to be improved.

**997. Corrosion Characteristics of Steels.** Chandler, K. A. (Design Engng. Dec. 1966. 50–55). In very clean air, the corrosion of steel is only slight even at higher humidities, but most atmospheres contain pollutants, such as sulphur dioxide and dirt, and in their presence the corrosion of steel may be comparatively high. As expected the corrosion rate in clean atmospheres is much lower than in industrial atmospheres. In industrial atmospheres there is, in fact, a good correlation between the amount of sulphur dioxide in the air and the corrosion rate of plain carbon steels.

**998. Taking Sulphur out of Flue Gas.** Anon. (Heat. & Vent. Engng. March, 1966. Vol. 39, No. **464**, p. 527). The Research Institute of Inorganic Chemistry in Ustin/Laben, N. Bohemia, has designed and tried successfully an absorption-type equipment which reduces the content of sulphur dioxide in flue gases to 15 per cent of the original value at much lower costs in terms of power and water than the usual methods. The wet process of desulphurization by ammonia is used and very large gas volumes have been treated. It is claimed to be much cheaper than current industrial methods but the new equipment would still raise the initial cost of a large thermal power station by 30 per cent.

**999. Air Pollution at Marseilles** (in French). Orieux, A. and Pouget, E. (Pollution Atmosphérique, Oct-Dec. 1966, Vol. 8. **32**, 411–438). An examination is made of the meteorological parameters upon which the levels of urban pollution depend. In the absence of vertical temperature gradient measurements, which are not yet available, a study is made principally of the influence of the wind on pollution at Marseilles, following a definition of the average wind velocity over 24 hours. The relation between the pollution level at the Chartreux station and the average wind velocity remains good up to a lower limit of 1,5 m/sec. The influence of the seasons, of rain and of the two dominant wind velocitites are examined, as well as the relation between the average wind speed at Marseilles and that of the synoptic station of Marignane.

The levels of pollution by dust and sulphur dioxide at the nine measurement stations are next studied. The influence of the planning and the particular topography of Marseilles are shown: if the pollution diminishes in general with the speed of the wind, the levels remain high in certain stations, either because of the velocity of the south-easterly wind or because of the Mistral, this latter therefore not being the ideal purifier for all areas. It has been possible to show the existence of large sources of pollution caused by basic or acid effluents.

**1000. Air Pollution by Motor Vehicles.** Lemaigre, P. (Pollution Atmosphérique, Oct.-Dec. 1966, vol. 8. **32**, 439–484). In the first chapter, the author takes stock of known facts and current research on air pollution, caused by motor vehicles, in the light of papers read before the Strasbourg Conference on Air Pollution in June 1964. This account first considers polluting agents and then deals with steps to be taken in connection with fuels and engines.

The second chapter concerns the most recent work carried out in the United States and in France, taking into account the different motor traffic conditions in the two countries. This section ends with an account of the directions now being taken by these studies.

The article concludes with a chapter which points out the French legislation, and recalls that pollution can be greatly reduced by appropriate vehicle maintenance in which proper adjustment of the engine idling speed plays a non-negligible role.

**1001. Definition of the tolerance range of the average value in measuring dust concentration.** (in German). Juda, J. and Budziriski, K. ("Staub", April 1967, **27**, No. 4, 176–178). 1. The author discusses the problem of tolerance range of the average value for dust concentration. An equation is derived for this purpose which is valid for a finite and infinite collective of concentration distribution under the assumption that a common logarithmic concentration distribution is involved. A nomogram has been developed for facilitating the calculation of tolerance range. The requirements to be satisfied and a method for the preparation of the measuring programme are given. The method is explained by an example.

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## Electric Power Convention

Leaders of all sections of the electrical industry met at the British Electrical Power Convention from 22-25 May to discuss and plan the contribution which the industry will make to a more dynamic and rapidly expanding British economy. The Electricity Supply Industry, the U.K. Atomic Energy Authority, manufacturers, contractors, the distributive trades and professional associations were all represented and delegates discussed a number of papers under the theme "Electricity for a Dynamic Britain". Mr. Richard Marsh, M.P., Minister of Power, was the guest of honour and principal speaker at the Convention Dinner.

Lord Nelson of Stafford, Chairman of the English Electric Company, presided at the Convention, commented that "the theme expresses our faith in our country's ability to overcome the present economic difficulties and expand to new levels of growth and prosperity". He added: "A vigorous electrical industry, in which developing technology is allied with keen salesmanship, is vital to the country's prosperity and the objectives of the Convention will be to pin-point some of the areas in which electricity can make a major contribution to the country's needs and to ensure that the industry is fully prepared for the challenge and the opportunities ahead."

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**The new report on the Investigation of Air Pollution, 1958-66, published as we went to press, will be fully reviewed in our next issue.**

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**FOR ROOM HEATERS
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Consult your Gas Board now regarding availability of these recommended fuels

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# Contributions to Cleaner Air

## Industrial and Commercial News

### REGISTRATION SCHEME FOR DOMESTIC HEATING ENGINEERS

"It is no secret that the boom conditions in the domestic heating industry have encouraged all manner of people to climb on the installing wagon with foreseeable results. Apart from the distress and anguish which can be occasioned to the householder who has the misfortune to deal with a 'Cheap-jack' installer it is obvious that this situation can have very serious repercussions on the legitimate installer. How can the householder know that he is negotiating with a legitimate heating engineer? How can the heating engineer convince the customer that it is good sense to pay a fair price for a first-class installation carried out to high standards? How can a bona fide heating engineer obtain a balanced flow of work if unscrupulous firms are quoting absolutely uneconomic prices for nebulous systems?"

We quote from a statement by D. E. Pither, Managing Director of the Heating Centre, which has just introduced a scheme for the registration of domestic heating engineers. It is a project that promises to be of real help to many people embarking on a central heating installation, and it should also be of considerable value to the reputable engineer.

The scheme is on similar lines to that operated by the National House Builders Registration Council, who issue Protection Certificates in respect of new houses built by Approved Builders. Applications for registration from domestic heating firms must give extensive information about themselves, including particulars of twelve installations made in the previous six months, about which reference may be made. Firms approved enter into a legal agreement with the Heating Centre and undertake to maintain accepted standards for their name to be entered in the Register.

THE HEATING CENTRE REGISTERED ENGINEER

*The emblem denoting registration under the scheme described*

Installations carried out by registered firms will be covered by a two-year protection certificate issued to the householder by the Heating Centre, backed by a member of the British Insurance Association. The householder thus obtains a guarantee both for installation and satisfaction in operation. If anything is wrong it must be put right, and even if the firm should be unable to meet its obligations the costs will be met by the guarantee insurance.

The cost of the scheme is naturally charged to the customer, and has been set at £5. 10s. for installations up to 150,000 Btu capacity. A further point made by Mr. Pither may be quoted:

"Obviously a scheme of this nature is designed to protect the customer from the unscrupulous trader. It is perhaps worth mentioning that at times the customer should be protected from himself. From time to time we encounter cases where customers have brought upon themselves considerable problems and unforeseeable extra expense by their own parsimonious attitude."

The Heating Centre is an independent, impartial service, which has a permanent exhibition at its headquarters at 34 Mortimer Street, London, W.1. The Centre will be glad to supply more detailed information about the Registration scheme.

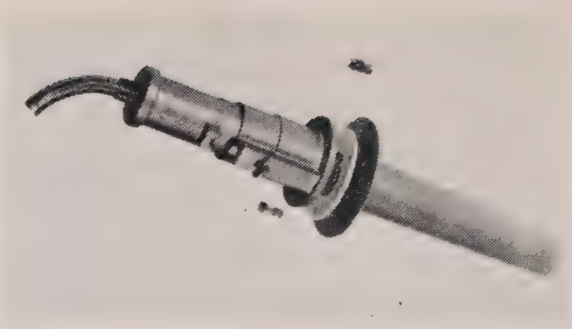
## NEW SMOKE ALARM

Photoelectronics (Arcall) Ltd., of 92 Oldfields Road, Sutton, Surrey, have developed a smoke alarm available in two types.

The Photoelectronic Smoke Alarm Type CCSA is designed on the principle of a collimated beam of light being projected across the flue or chimney and collected by a photocell receiver opposite, preferably fitted with "Everclean" Windows. The photocell being a light dependant resistor, any reduction in the strength of light reaching it (caused by passing smoke) increases the voltage developed across it. This change is used in the control unit to fire a thyraton circuit, always pulling in the alarm relay precisely at the desired preset point. This changes the green light to red, on the front of the control unit and energizes the alarm bell circuit.

The Photoelectronic Smoke Density Indicator Type CCS1, operates on the same principles as the Smoke Alarm, but also incorporates an obscuration meter on which the density of smoke is indicated at all times. Graphic recording instruments can be connected.

*The control unit of the Photoelectronics (Arcall) Ltd. Smoke Alarm*



*The Light Beam Projector or Receiver with flue fitting*

The Smoke Alarm is ideal for use in unattended installations and the Smoke Density Indicator for attended ones. There are many kinds of application for which they are suitable and they are designed for all sizes of flues and stacks.

*The "Everclean" Window*

Many of the first industrial users of Smoke Density Indicating and Alarm equipment experienced difficulties due to the sooting-up of the optical systems of the light beam projectors and photocell receivers, particularly where these were mounted where a positive pressure existed in the flue or stack.

The Central Electricity Generating Board carried out long and detailed research on this problem and designed their own form of optical system—the "Everclean" Window. This was patented and Photoelectronic (Arcall) Limited now manufacture them under licence and use them in conjunction with their Smoke Density Indicators and Alarms.

The name "Everclean" itself describes the function of this system and eliminates the need for frequent lens cleansing and ensures consistent operation without attention. Where deposits occur on the inspection tube glass, errors in measurement take place which can build up until the glass is cleaned. The "Everclean" window, by means of a honeycomb unit, keeps the optic clear of dirt, maintaining long-term clear vision, in some conditions for a period of up to two years and is equally effective in both negative and positive pressure locations. It is of particular advantage where Density Alarm and Measurement equipment has to be fitted in locations so difficult of access as to render periodic lens cleaning quite impracticable. Also, where the heat transmitted from a flue would be too great for the direct mounting of the receiver, in which case the "Everclean" extension would act as a heat loss.

## AMASSHEAT POWERPACK CENTRAL HEATING

An interesting development in solid fuel central heating is a ducted warm air system developed by Amassheat Ltd. (2, Vivian Mansions, Vivian Avenue, Hendon, London, N.W.4) in co-operation with the National Coal Board. The heart of the system is a fire, behind glass, in the living room. A fan circulates warm air from the fire, either with or without ducts leading to other rooms. One of the features of the system is a "Computair" temperature controller, which consists of an electronic device that continually senses temperature and passes on the information to a small computer unit. This unit is capable of deciding when temperature is beginning to vary and what action to take. This is done by causing the speed of the fan, which is blowing warm air into the room or the ducts, to increase or decrease. A constant temperature is thus maintained, and it is stated that by this means the predetermined temperature in the house is controlled to 1 degree.

Because of this fine control it is claimed that running costs will be lower than with any other comparable warm air system, and could be as little as 16s. per week over the year. The Powerpack, complete with ducted system and an attractive modern surround, including installation, is priced at £225.

## HOT WATER METERING

The district heating symposium reported in this issue brought to the fore the question of whether it is necessary to meter the hot water used by each dwelling, with charges based on such consumption. One view is that it is not necessary, adding a complication to the system that is best avoided. The other view is that metering is essential to avoid wasteful usage and to ensure that each consumer pays just his fair share. Experience seems to show that metering is needed and it is in fact in general use in the extensive district and group heating schemes on the continent.

Arising out of the symposium, the Clorius U.K. Organization have sent us their literature on their hot water and heat meters. These can of course be used in blocks of flats as well as group and district heating schemes.

The Clorius heat meter is a neat device fixed on each radiator in a heating system. It is a so-called "evaporative" meter, consisting of an insulating plastic housing enclosing a metallic heat conductor that transfers the mean temperature of the radiator to the liquid in a glass tube in the conductor. The evaporation of the special fluid is the measure of the heat emission of the radiator, the evaporation being registered on a scale chosen proportionally with the radiator size, transmission cipher placing, etc. With the radiator valves closed, the meters only record a few units which partly cover the loss of heat from boilers and pipings, etc., which is independent of the individual tenant's consumption.

The Clorius hot water meter consists of a Venturi-tee built into the water pipe and the meter proper. From the Venturi-tee a shunt current off the main flow—always accurately proportional to the quantity of water drawn—goes to the meter housing where a metallic heat accumulator is heated in proportion to quantity and temperature of the water. This heat goes to the fluid-filled branch of a closed glass tube shaped like an inverted U and, by distillation, part of the fluid passes over to the other "cold" branch. The quantity of fluid distilled over is read on a scale and is proportional to the product of the

**cut costs**

Clorius Heat and Hot Water Meters can help reduce costs by as much as 40% where central boilers are used. Let Group and District Heating be your answer to the problem of clean air, and Clorius meters with supporting heat accounting service will solve the problem of metering individual consumption at an economic price.

**CLORIUS U.K. ORGANIZATION**

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WORCESTER ROAD,
BRISTOL 8. tel 30301

water quantity used and the water temperature.

Three and a half million Clorius meters are in operation in Europe, so that the experience of the manufacturers is very considerable. The firm is centred in Denmark, and is the meter most in use in that country. Organizations have been established in 14 European countries. The meter has been tested and approved by the Danish Public Housing Authorities.

The U.K. agents are Lowell Baldwin Ltd., 4/5 Worcester Road, Bristol, 8.

## COAL FIRED SMOKELESS HEATING INSTALLATION AT THORNABY-ON-TEES

A £71,000 John F. Kennedy House at Thornaby-on-Tees was opened on 17th April by T. Dan Smith, chairman of the Northern Economic Planning Council.

The building is the third purpose-built hostel developed by Thornaby-on-Tees Corporation Housing Committee as part of a specially-designed precinct for elderly persons. The residents have the benefit of the latest concept in modern, safe, cheap heating under a National Coal Board solid fuel group heating scheme.

Teesside civic chiefs and top local government officials heard Mr. Smith say it was extremely important that the coal mining industry must continue to make a maximum contribution to the region's economy. The industry had made many magnificent contributions in the past in terms of management skills and devotion of staffs, and in the part the miners had played in the development of the region.

"It is important that the architects and people responsible for the development of new buildings recognize that coal has a big part to play, not only in the buildings themselves, but in the economy of the region," he continued. "I would congratulate the architects and Thornaby Corporation for being far-sighted enough to combine in this modern conception, a material which, although it may be old, has in fact been applied here in the most modern way."

Mr. Smith was accompanied at the opening by Dr. William Reid, the Coal Board's Divisional Chairman in Northumberland and Durham and a fellow-member of the Northern Economic Planning Council.

After considering all systems of central heating, the Housing Committee decided that the whole precinct, comprising flatlets and bungalows, should be served by coal-fired boilers. The group heating installation heats the whole of the precinct together with 38 flatlets, and also provides domestic hot water to Kennedy House. The external mains run in ducts, the covers of which form a number of pathways which in winter will always be free of ice. The fuel is washed singles, delivered to the fuel bunker by N.C.B. "tankers".

The group heating installation consists of No. 2 size 10 K.L.R. "Colonel" Beston Robin Hood C.I. sectional boilers, rated at 1,514,320 Btus/hr., with Ashwell and Nesbitt Ltd., size A.L.C. 3/BWR bunker-to-boiler model modulating type Iron Fireman Automatic Stokers rated at 1,680 Btus/hr.

The boilers operate strictly within the requirements of the Clean Air Act. Cheaper running costs were one of the major economic factors which commended solid fuel group heating for the project. Other factors were ease of operation, low maintenance and running costs and a speedy build-up of heat. Under the system, a tenant at the hostel pays a weekly rent and receives as much heat and hot water as he requires at no additional cost.

## COMMERCIAL HEATING BY ELECTRICITY

Although there is a great deal of information available at the present time on electric central heating for domestic premises, there has not, until now, been anything available on the heating of commercial and industrial premises by this method.

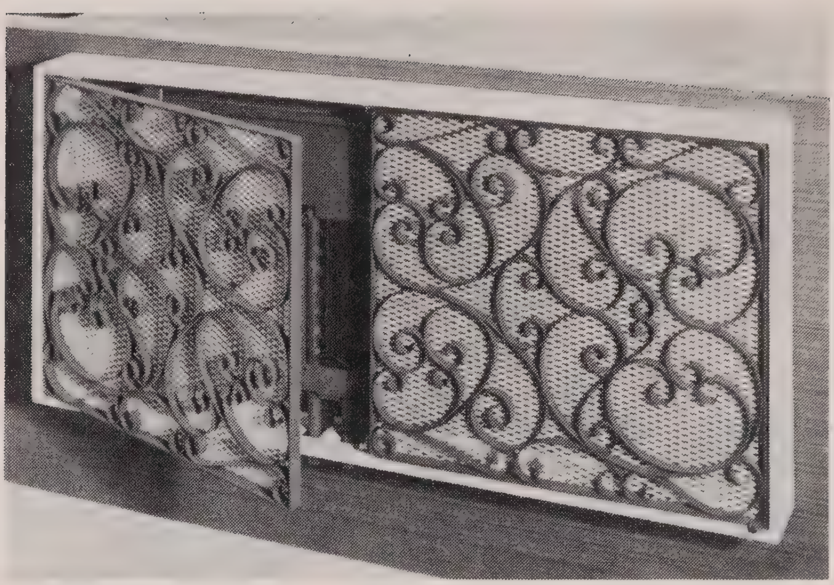
This omission has been rectified by Parkinson Cowan Heating, Limited, Bastian & Allen Electrical Division, who have just issued a unique publication describing the benefits of commercial and industrial heating by ConStor.

This fully illustrated 12-page brochure gives comprehensive technical information on the heater and its applications, as well as full case histories, including detailed running costs.

Like ordinary storage radiators, ConStor uses "half-price" electricity to store up heat during off-peak periods, but is designed not simply to give off this stored heat continuously throughout the day and night, but to conserve it until the premises are actually in use. Then special long life fans draw in cool air and warm it in the heater to provide a supply of warm air precisely matched to meet the requirements. This control of heat output gives the commercial user freedom to strike the most economical balance between the cheapest off-peak tariff and the lowest

Better
things
are
electric

*Issued by the Electricity Council, England & Wales*



*A specially finished version of the new Sterling Heater, with front partly open*

cost installation. The appliance is equally efficient not only when working at maximum output during the few weeks of very cold weather, but also at low output during mild weather.

## NEW STERLING HEATER

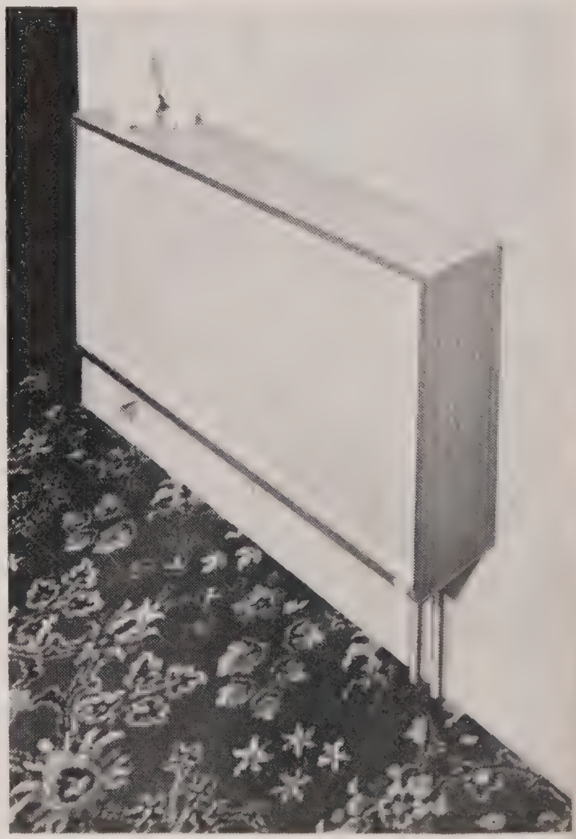
We illustrate an attractive version, with front partly open, of a new heater introduced by Sterling Heating Systems, Ltd., Sterling Works, Dagenham, Essex. The heater replaces radiators in any hot water central heating system and includes a heat-exchanged unit with built-in thermostat. The system will immediately heat the air in the room instead of the previous lengthy process of waiting until the surrounding air is warmed by radiation. The impeller control has five switch setting—off, boost, normal, silent (for retaining a comfortable temperature when once the room is warm), and cool (for circulating cooling air in summer).

Units will operate from any hot water system, whether fired by gas, oil, or solid fuel. Existing installations can be adapted without any structural alterations.

## NEWS FROM CRANE

Crane, Ltd. (15 Red Lion Court, Fleet St., London E.C.4) the well-known makers of heating equipment recently held an interesting press conference in London, when a number of their newer products were shown and demonstrated. These included solid fuel and gas fired boilers, skirting heating systems, a gas warm air central heating system, and heating by fan convector. There are two skirting heating systems, which are continuous and unobtrusive radiators using hot water. One type is of cast iron radiant panels, and the other called the "Sunnybase" uses finned copper tubes covered with snap-on steel panels.

The "Sunnyaire" fan convector system consists, basically, of a fan which drives filtered air through a heat exchanger. The heat exchanger is fed with hot water from a small-bore system. The fan has a three speed control and a thermostatic control which allows the room to be warmed up quickly and then held at a steady, com-



*The Crane "Sunnyaire" fan convector*

fortable temperature. Sunnyaire will switch off when the water in the system is too cold, which allows the boiler to warm up quickly and automatically ensure that the unit does not run when the heating is at a low level setting at night. It can also be used for cooling on hot days.

## REPCO SKIRTING HEATING

Another skirting heating system recently exhibited at the Heating Centre is the Repco, made by Bekon-Bell Ltd., of Farnham Road, Slough, Bucks. It consists of a $\frac{3}{4}$ in. copper tubular element surrounded by aluminium fins and housed in a 7 in. high casing. This acts as a heat exchanger, and the hot water can of course be derived from any type of central heating boiler. The system quickly responds to manual or automatic temperature control, and all valves are eliminated except as a means for isolating a complete loop. Heat emission is controlled by a damper which runs along the top of the casing, by means of which 70 per cent of the heat output can be checked.

The Repco skirting convector has recently been selected by the Council of Industrial Design for the Design Centre, London.

## NEW TYPE OF BAG FILTER

W. C. Holmes & Co. Ltd., of Turnbridge, Huddersfield, announce that their range of dust collection and control plant has been further extended by the introduction of a Vibro-Chamber Bag Filter. This unit has been developed on the Continent by Standard Filterbau GmbH, of Munster.

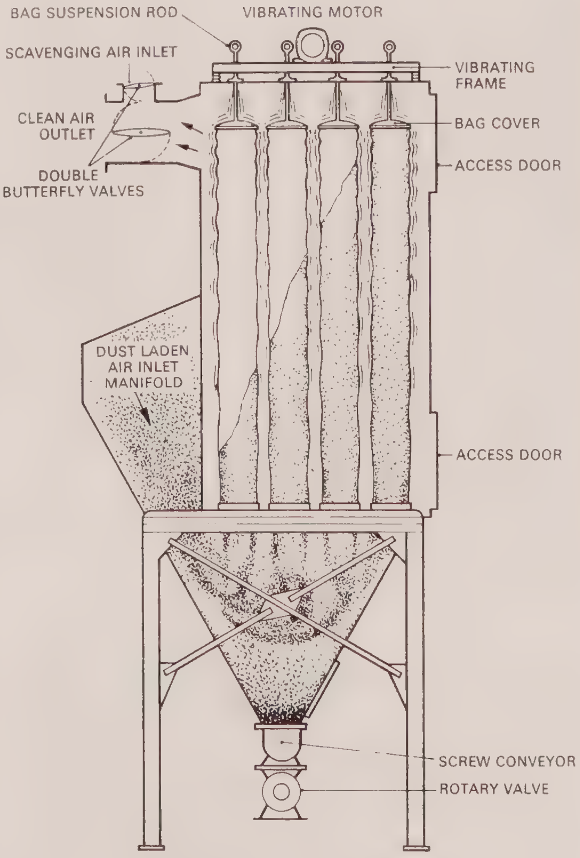
A typical installation comprises an assembly of filter compartments arranged to handle the required volume of gas. This method of construction simplifies both manufacture and subsequent assembly on site.

The filter bags are attached to spigots carried from suspension rods which are securely clamped to an externally mounted vibrator frame. The suspension rods pass through rubber bellows to prevent dust leakage during the vibration operation. The vibrator frame is carried on rubber mountings from the top of the filter casing and is operated by a motor bolted to the centre of the frame. The eccentrics keyed on to the shaft of the vibrator motor can be adjusted to either increase or diminish the vibration amplitude to meet filtration conditions.

At the same time that the vibrating cleaning operation is being carried out, scavenging air is sucked through the filter bags from the clean side using double butterfly valves to simultaneously isolate the compartment and admit the scavenging air. This carries dust removed from the filter bags into hoppers beneath the filter.

The Vibro-Chamber Filter is fully automatic in operation and is controlled electrically from a time switch which is adjusted to provide the correct period of vibration for each filter compartment in turn.

A design feature of the Vibro-Chamber Filter is the method of filter bag suspension which enables individual bags to be tensioned from outside the filter casing. The correct tension can therefore be readily maintained with the result that bag life is extended. A further advantage is that all mechanical components are outside the filter casing where they are readily accessible and are not exposed to the dust-laden air.



**Section of Vibro Chamber Filter**

*The new Holmes Vibro-Chamber Bag Filter*

## PARKRAY CENTRAL HEATING AT TAMWORTH

Tamworth Borough Council have installed 91 Parkray 77 K solid fuel room heaters in their new council housing estate at Tinkers Green, Wilncote, on the outskirts of the town.

Overspill families from Birmingham and families from slum clearance areas in Tamworth will be among the estate's tenants, occupying three and four bedroomed houses, as well as maisonettes, bungalows, and an old people's welfare unit.

Plans for the 219 dwellings on the estate were drawn up by the Tamworth Rural District Council, which later merged with the Tamworth Borough Council before building actually commenced. The Tinkers Green estate is the first major municipal housing scheme to be opened since the change-over.

The Housing Committee of Tamworth Borough Council decided to experiment with solid fuel central heating, following a report from the Housing Manager, D. W. A. Northway, F.I.H.M. Mr. Northway commented:

"Alternative methods of heating have been provided in the dwellings on other new estates and where only part of the dwelling is heated condensation problems have arisen, particularly in rooms where no provision has been made for heating. The advantage of the solid fuel heating system installed in the houses on this estate provides for full central heating and it is hoped by this method the problem of condensation will be eliminated. There was also, of course, the question of low heating costs. Solid fuel heating is cheap to run—an important factor in council housing properties."

The possibility that the new Development Areas of Tamworth will become smoke control areas was also taken into consideration when the selection of a heating system was made.

The three-bedroomed homes fitted with Parkray 77 K 'open fire behind glass' room heaters provide 'whole house' central heating as well as domestic hot water. The appliance itself is fitted in the living room, and services radiators in each of the bedrooms, the kitchen and the hallway, plus a towel rail in the bathroom.

### Retarded Spark Timing

Experiments made by the Air Pollution Control District, County of Los Angeles, show that there are significant reductions in the CO and hydrocarbon emissions in petrol engine motors when the spark is retarded when the engine is idling, and also when the cylinder "quench area" is reduced by making the combustion chamber more compact in shape. Long distance tests showed that these modifications reduced hydrocarbon emission to 262 ppm, and 1 per cent CO, compared with Californian regulation requirements of 275 ppm and 1·3 per cent, respectively.

### Babcock and Wilcox Lead

A *Times* report says that "an intensive research programme, launched as a 'gamble' well before the first strikes of North Sea natural gas had been made, has put the Scottish-based Babcock and Wilcox group into a commanding lead in the field of natural gas-fired boiler installations both for electricity generation and industrial use."

### Locomotive Smoke Case

At Bolton Magistrates Court on 17 March, the National Coal Board was fined £50 under the Clean Air Act for the emission of dark or black smoke from steam locomotives on a mineral railway. There were five offences.

The Board's solicitor expressed regret for the incidents and said that nearly £20,000 had been spent on special equipment, and various steps had been taken to prevent such emissions, including the employment of a full-time smoke inspector. He added: "The fact that the Board has taken these very extensive steps to comply with the Act provide it with no defence. These offences have occurred through the unfortunate intervention of the human element".

### Smoke Control Area Prosecutions

Two more householders were prosecuted at Oldham Magistrates Court in February for contravening the smoke control area regulations. In one case, where it was pleaded that the defendant was elderly and unwell, a fine of 10s. was imposed. In the other, the defendant having been warned three years ago, the fine was £2.

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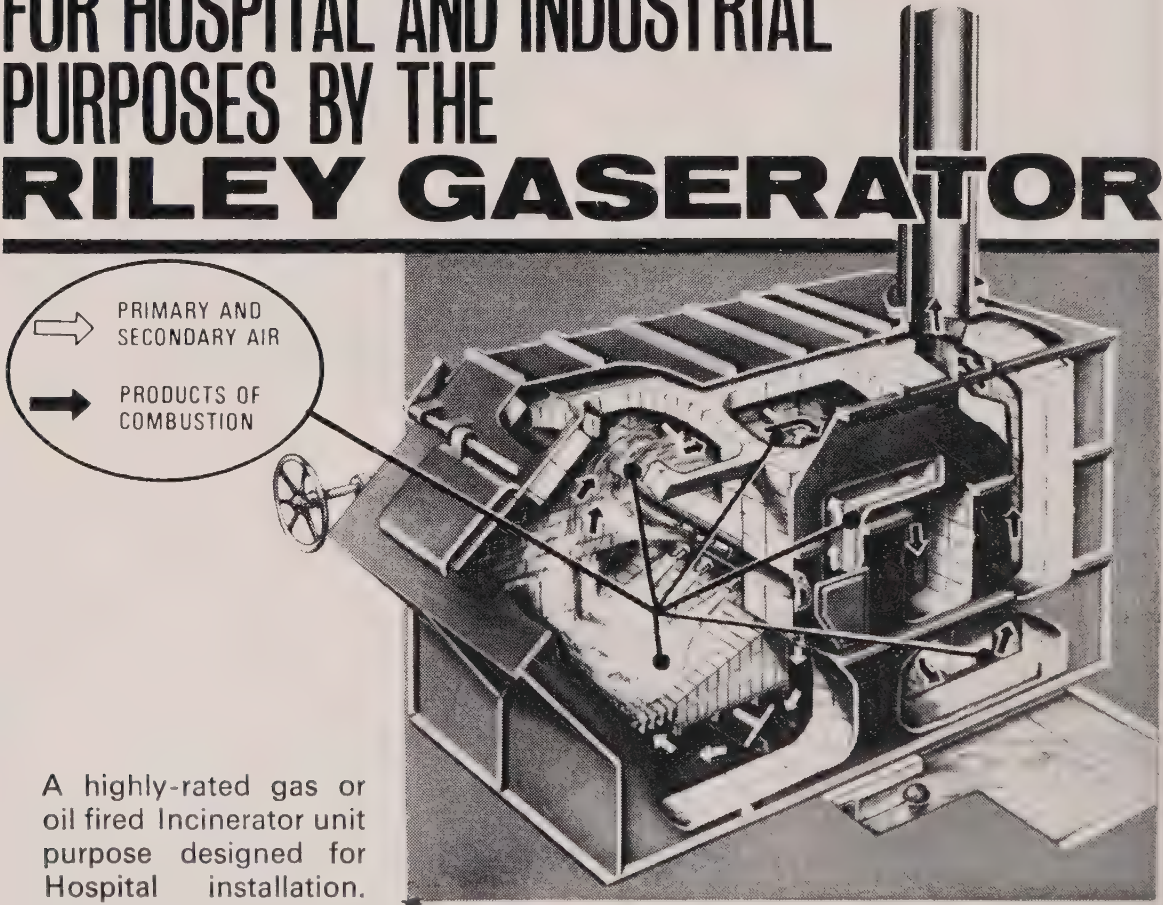

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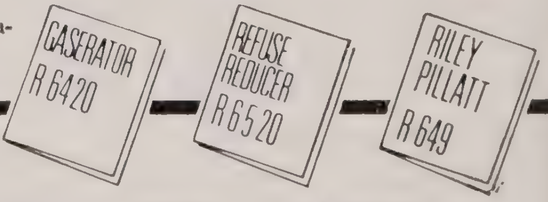

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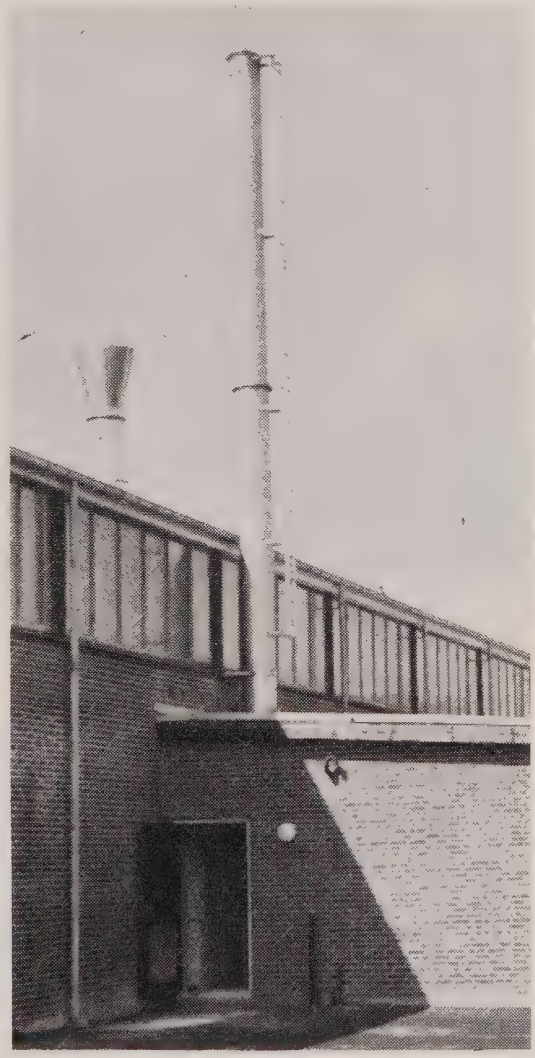
IN.53

# BEAUMONT
# FOR CHIMNEYS

## INTRODUCING THE *BEAUVENT INSULFLO CHIMNEY



The photograph shows one of the ***Beauvent Insulflo** chimneys which has been erected in Denmark.

The ***Beauvent Insulflo** chimney was designed by us for the Scandinavian market over two years ago to counter the extremely cold climatic conditions experienced during the winter in Scandinavia.

It was found that, under conditions of extreme cold, aluminium cladding did not always prevent smutting from chimneys serving oil-fired boilers when on low load conditions during the harsh Scandinavian winter. We thus designed the ***Beauvent Insulflo** chimney.

This chimney consists of two concentric steel shells which have an annular space of 2 in. between the shells. This space is filled with Perlite mineral insulation.

** Registered Trade Mark*

For further details contact:

**F. E. BEAUMONT LIMITED**
**465-483 Rathgar Road, London, S.W.9.**
BRIXTON 4066 TELEX 25837

*Midlands Office:* **28 Birmingham Street, Oldbury.**
Telephone: BROADWELL 2039 TELEX 338146

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*Illustrations showing the MH4 in an office and in the home.*

The Knightbridge range of heaters have been designed for incorporation within a normal building structure. Alternatively, installations for internal walls of breeze block structure require a surface mounted surround.

PRICE RANGE FROM
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All prices include Purchase Tax.

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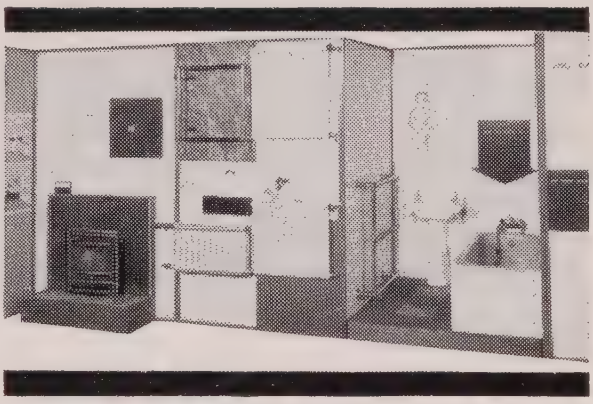
**or Telephone: Potters Bar 57121 Ext. 241**

*Printed by The Leagrave Press Ltd, Luton and London*

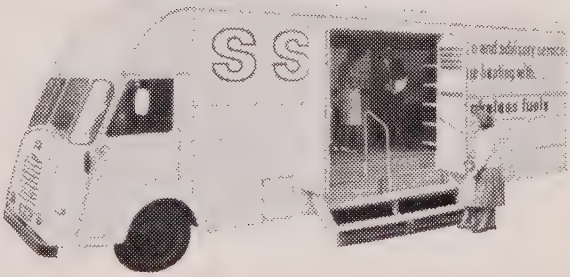
# More ammunition for clean air campaigns

**Local Authorities organising "Clean Air" campaigns, establishing Smoke Control Areas, organising House Improvement or Conversion schemes are invited to take full advantage of the services offered by the Solid Smokeless Fuels Federation, and available free of charge.**



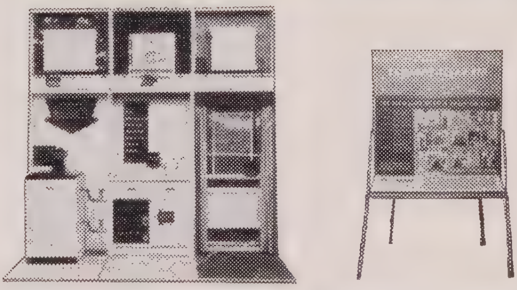
## EXHIBITION

A complete pre-fabricated and self-contained "Clean Air" Exhibition: adaptable in size with one, two, three or four approved smokeless appliances under fire, and displays of the smokeless fuels available in the district.



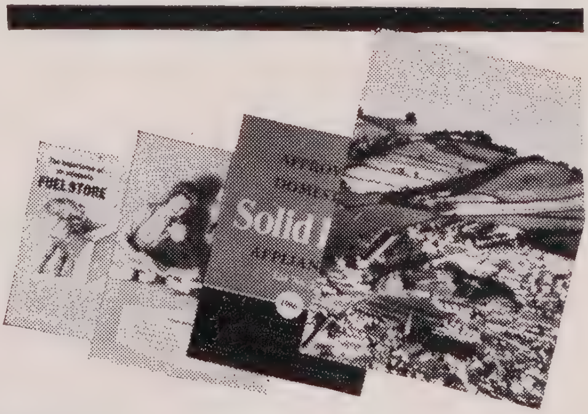
## MOBILE UNITS

Manned with technical demonstrators, to advise and help residents in proposed or newly-formed Smoke Control Areas. They incorporate approved appliances under fire and a display of the solid smokeless fuels.



## DISPLAYS

A range of portable units variously displaying instructional panels dealing with Clean Air and the Act, a typical central heating unit, fuel displays and literature displays.



## LITERATURE

Informative literature is available free to Local Authorities explaining the Clean Air Act, and giving full information on solid smokeless fuels and the appliances.

*For full details of S.S.F.F. Services and literature apply to:*

**SOLID SMOKELESS FUELS FEDERATION,**
**York House, Empire Way, Wembley, Middlesex**

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You don't have to be a poet to appreciate the importance of clean fresh air.

The pollution of our air costs the nation not less than £250,000,000 a year, while the inefficient burning of fuels send a further £40,000,000 up the nation's chimneys.

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# SMOKELESS AIR

JOURNAL OF THE
NATIONAL SOCIETY FOR CLEAN AIR

No. 143 ⋆ AUTUMN 1967 ⋆ 3s.

*In this Issue*

Reports on: Grit and Dust, Alkali Works, Investigation of Air Pollution, Road Vehicle Pollution ★ Alkali Act Prosecution ★ Industrial Chimneys from Oil-Fired Plant Electric Vehicles ★ Nuclear Power

# industry

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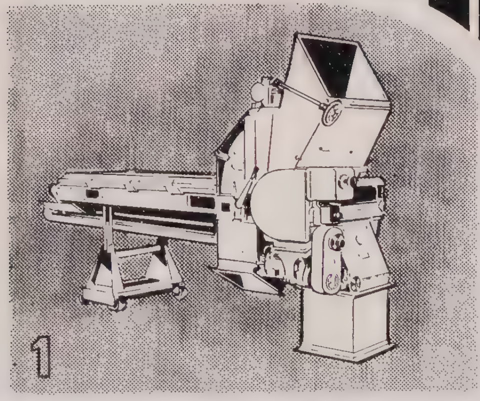

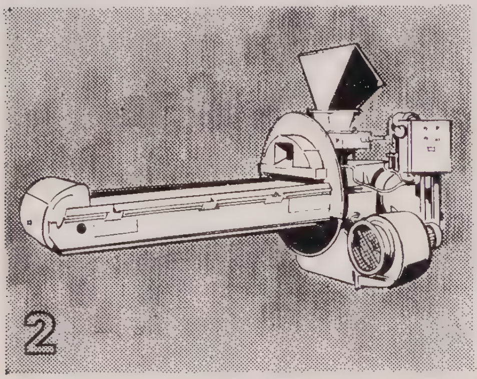

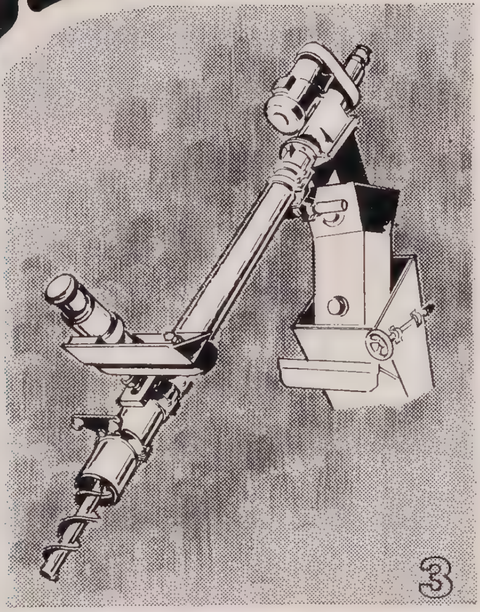

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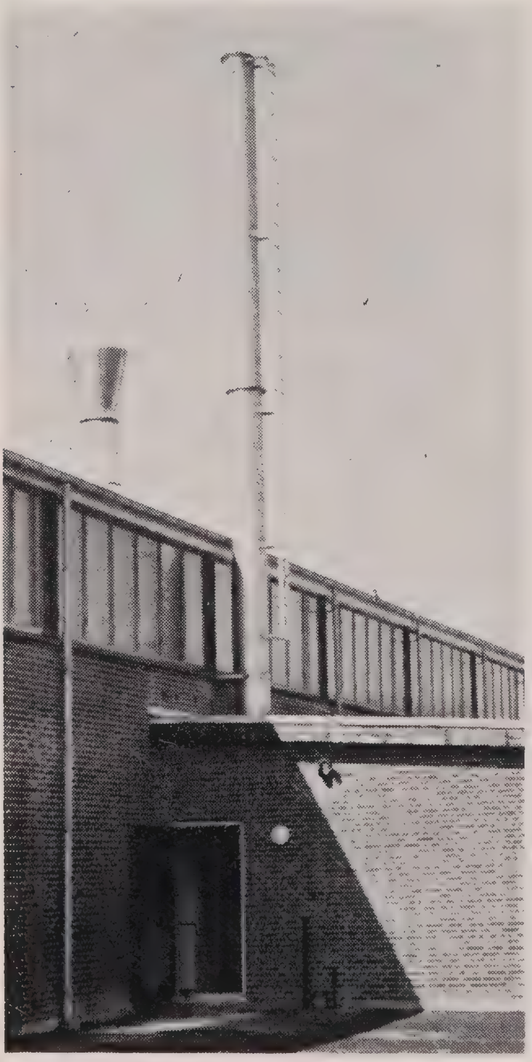

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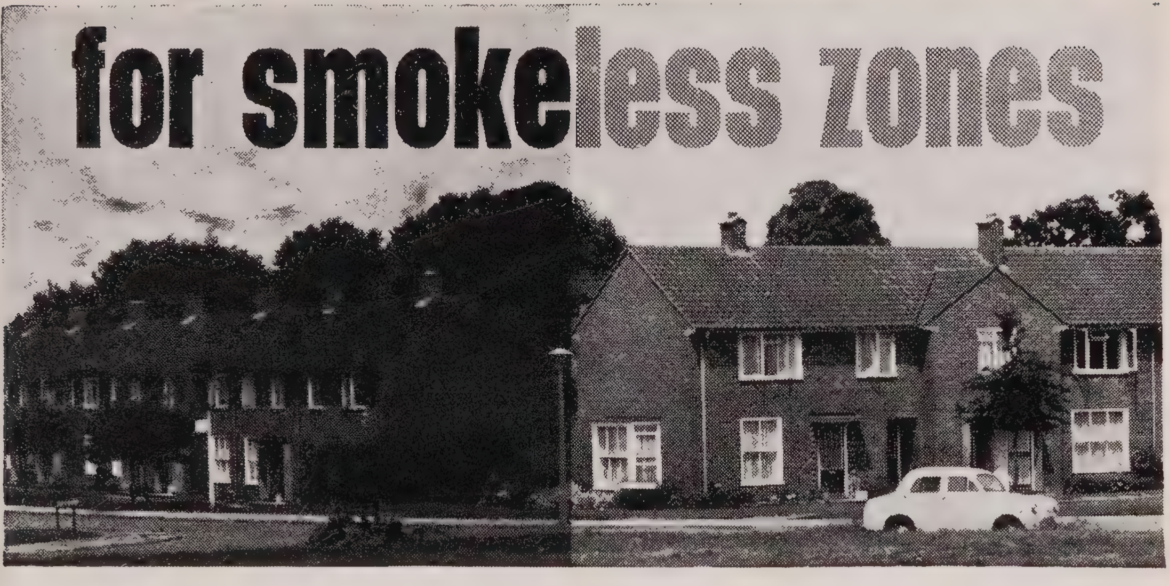
Big news for smokeless zones



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*'Coalite' Nuts for*
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THE MODERN SMOKELESS COAL

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The Riley Refuse Reducer is available in two basic sizes:—

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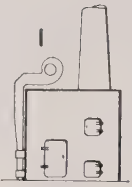
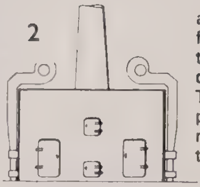
'Duplex' (**2**) can accept up to 9 tons per 8 hours burning.

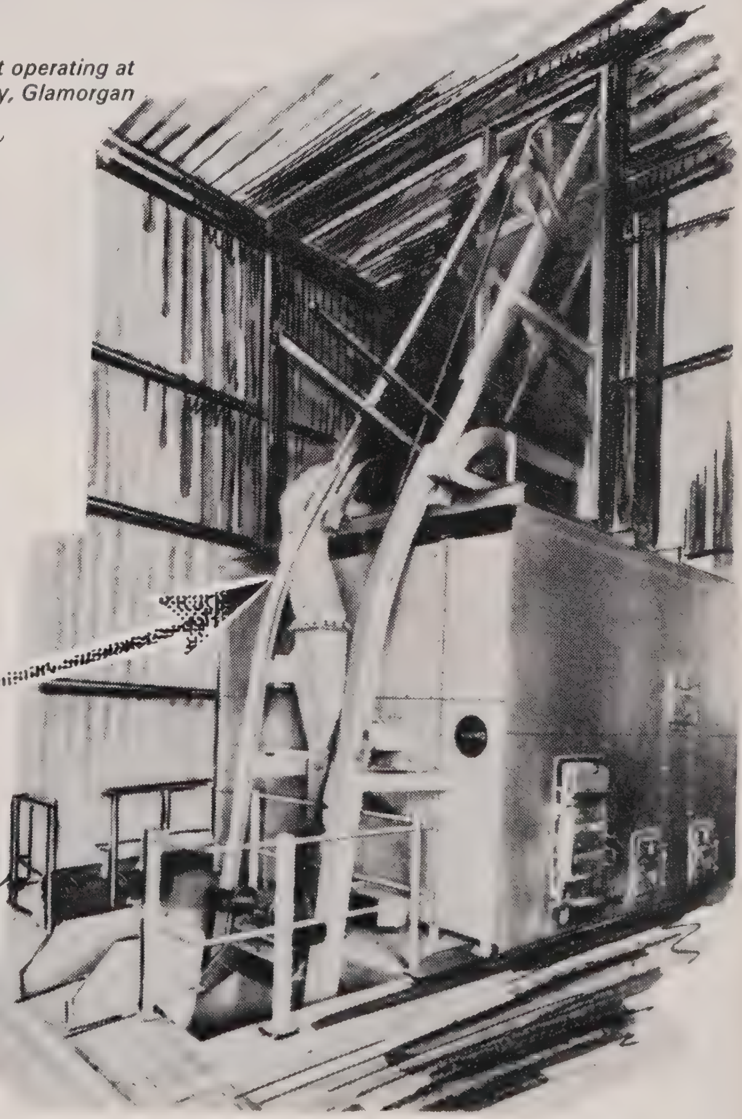


These burning rates are based on refuse having a density of 2½-3 cwt per cubic yard, with a calorific value of 4,000 Btu per lb.



The system allows for flexibility, as an initial unit can be enlarged for greater capacity by the addition of a secondary combustion chamber and forced draught fan. This equipment can also be supplied to suit individual requirements, not wholly covered by the two basic units.

*Illustrated is a 'Simplex' unit operating at Messrs. Midland Silicones Limited, Barry, Glamorgan*



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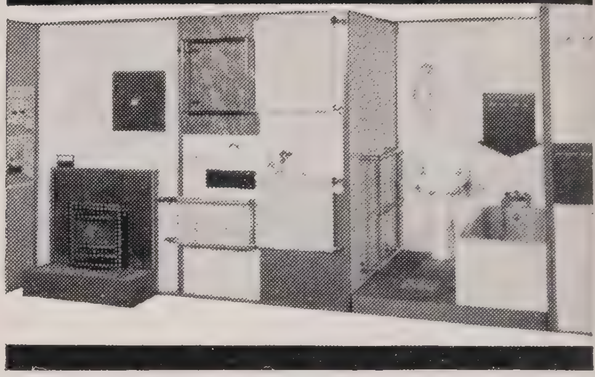

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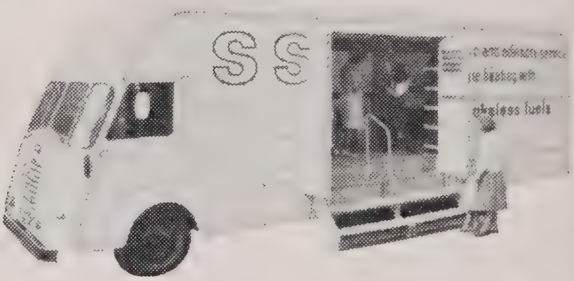

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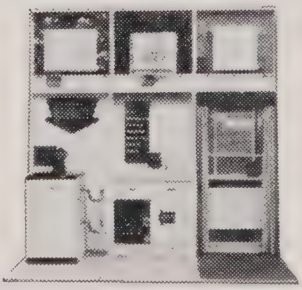

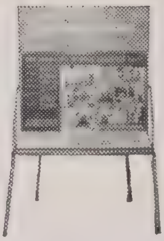

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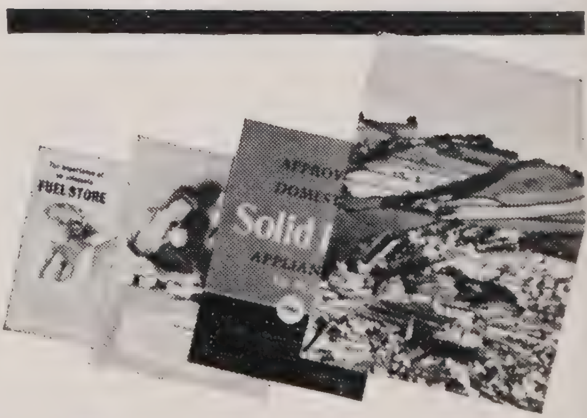

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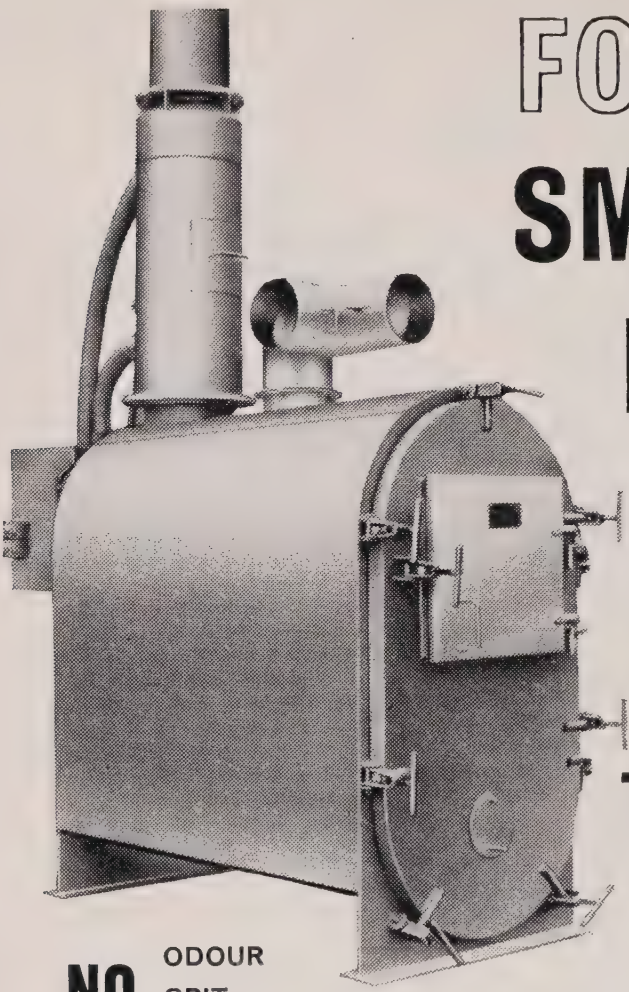
## MEETING NOTICE

**Meeting with U.S. Plant Engineers, 2 October (see details on page 38)**



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# SMOKELESS AIR

Vol. XXXVIII No. 143 Autumn 1967

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: CHAncery 5038 (Editorial and Advertising). Editor: Arnold Marsh; Asst. Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SMOKELESS AIR only, 12s. per annum, post free.

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*Ships, towers, domes, theatres and temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air.*

# SMOKELESS AIR

## *Broad Front*

A FEW weeks ago we were anxious about the contents of this issue. All seemed quiet on the clean air front. But, as the following pages will show, there came a batch of important reports that showed how broad the front is, and how in one sector after another activity and pressure is being encouragingly maintained.

There is a long-awaited report on Grit and Dust Emission, with a Ministry circular and the promise of regulations to come, which will lead to the full implementation of those sections of the Clean Air Act that deal with this particular problem. Then there are the reports from the Alkali Inspectors and from the Warren Spring Laboratory, each of which deals with its own special aspect of air pollution control and investigation. Finally, there are two reports dealing with the question of pollution from motor traffic, the official one, *Cars for Cities*, in which it is one subject among the many that are examined, and the N.S.C.A. report *Air Pollution from Road Vehicles*.

Two of these subjects are down for discussion at the Society's annual conference at Blackpool next month—road vehicle pollution, and grit and dust emissions. Thus a very early opportunity has been provided for the clean air movement as a whole to express its views upon them.

## *A New Bill?*

Although the Private Member Bill on clean air, introduced by Robert Edwards, M.P., was given a second reading (as reported in our last issue) it was unable to proceed further during the parliamentary session and is now lost. However, it is hoped that another Bill may be introduced during the next session, and if this is the case clauses will be suggested and supported by the Ministry of Housing and Local Government.

The Society, through its Parliamentary and Local Government Committee, has in fact just been studying proposals for improving the Clean Air Act, based on the report to and subsequent discussion at the meeting in May 1966 that had for its theme the tenth anniversary of the Act. It has now become necessary for the Committee to make its suggestions without delay. If any readers have observations or proposals to make about strengthening the Act we would be glad to have them—if they can be sent in at once.

## *Strengthening Smoke Control*

The hoped for new Bill will not be able to deal with one aspect of smoke control that many people would like to see improved—the grant arrangements. This is because a Private Member Bill cannot include matters which affect public expenditure.

But one of the most important provisions will, it is hoped, be one to deal with the problem of the sale of bituminous coal in smoke control areas, which we discussed in our last issue. The clause on this in the Edwards Bill aroused much concern in some quarters, and would have been warmly debated if the Bill had gone to Committee. It may be recalled that it made it an offence to buy, sell, or deliver any solid fuel other than an authorized fuel in a smoke control area, except for use in exempted premises. This would have meant court proceedings in every case.

An alternative form of control that has been suggested seems to be finding favour—namely, that solid fuels be sold in smoke control areas only under licence, with powers to revoke a licence if any of its conditions are contravened. No court proceedings (other perhaps than with respect to appeals) would then be necessary. The principle is discussed in a paper to be given by Alan R. Smith, on the cost of smoke control, at Blackpool, when it is hoped it will be fully debated.

That something must be done has been made still more evident by the replies to a question on the subject included in a questionnaire on smokelessness in new housing sent by the Society to all local authorities. The response to the questionnaire—gratifying in its numbers—will also be the subject of a report on behalf of the Committee at Blackpool. It is clear from this that the majority of local authorities with smoke control areas are having their efforts sabotaged by the practice, even though some do not seem to be doing all that they might do to prevent it.

## Sulphur

It is very much hoped that the proposed Bill will include provisions on the control and reduction of emissions of sulphur dioxide. There has been frequent disappointment expressed that the Clean Air Act did nothing on this problem, other than to a limited extent under chimney height control. The reason for this apparent neglect of a serious pollutant was of course simply that no practical direct measures for its abatement were available, and even now, as was shown in the N.S.C.A. report on sulphur dioxide, there is no clear, complete solution even on the horizon.

The most commonly expressed hopes are through greater use of sulphur-free, or low sulphur, sources of energy; higher chimneys; and special fuel usage controls in areas of high density building. But how to embody these in an Act of Parliament?

It is less the total volume of sulphur dioxide emitted than the concentration experienced at living levels that matters. (By the term "living levels" is implied not only ground level breathing levels, but at the tops of tower offices and high flats.) The culpability of any emitter is related to four main factors: the sulphur content of the fuel, the quantity of fuel burned per hour, the height of the chimney, and the environment (*i.e.*, the influence of nearby buildings, etc., on the dispersion of the flue gases.) These are in fact the factors that enter into the calculations indicated in the *Memorandum on Chimney Heights*, and it may well be that the best line for new legislation would be in the strengthening and extension of the existing powers to control the height of chimneys. This is in any case needed to bring in chimneys that escape planning control, existing chimneys that have to take heavier loads, and to offices and shops, and possibly even homes. Maybe, too, the present standards could be made stricter.

Where in any instance there was objection to meeting a required chimney height, on grounds of cost, architecture, town-planning, etc., the alternative would be simple: use of fuel without sulphur, or with a sufficiently low sulphur content to match the desired chimney height.

## Conference

Several references have been made to the annual conference at Blackpool from 17 to 20 October. The arrangements for this have now been completed, and the papers are in process of being printed for sending out in advance to delegates. It can be said that the papers are of exceptional importance and interest, and will cover a great deal of what we referred to above as the broad front.

There had been some misgivings that the economic situation, especially as it affects the local authorities, might have a seriously adverse effect upon registrations, but happily this is proving not to be the case. Numbers may be a little down on the last regular conference, in 1965, but if they are it is likely to be by only a small margin.

It had been wondered, too, if a recent announcement by the Association of Municipal Corporations, on the proliferation of conferences, might have some effect, as far as local authorities are concerned. There may well be a case for a reduction in the number of more generalized conferences, which touch lightly and briefly on many topics, but specialized conferences such as our own are in a different category. If it is necessary to discuss air pollution at all, a conference must be long enough, and capable of going into the problem at some depth, to make profitable the attendance of those who are intimately concerned with the subject both in practice and in study. And this does not mean local authority delegates only. One of the greatest values of the N.S.C.A. conferences is that they bring together, as no other conference can, all who are concerned with clean air, from the local authority men to the fuel technologists, from the commercial people to the research workers. It is the bringing together of so many diverse interests, both in the meetings and in social contacts, that gives our conferences their vitality and their value, all under the single theme of clean air.

## *Conference Contrasts*

On the subject of conferences, it is interesting to compare the way in which our own have evolved with the way in which those of our kindred organization, the Air Pollution Control Association of America, have evolved. Both bodies are voluntary in character, and both have an open membership. Both, too, have grown in the face of frequent difficulties. But as far as conference procedure is concerned—and in other ways too—growth has been along quite different paths. This year we find that our own annual conference next month will have a mere 14 papers and addresses, but that at the A.P.C.A. conference at Cleveland in June there were no less than 198 papers presented under 34 panels. Again, our own papers are printed together in a volume that every delegate receives, but with the A.P.C.A. each author prepares his own duplicated preprints, and then each delegate collects what he wishes to read from a special office during the conference. They then attend which of the sectional meetings appeal to them. It is an interesting divergence of methods, and it is not possible to say whether one is better than the other. Each has obviously grown in the way it has to meet particular requirements.

### Better Heating for the Elderly

Under the new cost yardsticks for housing authorities whole house heating is accepted to be essential in one case—in dwellings built for old people, said Mr. Robert Mellish, Joint Parliamentary Secretary to the Ministry of Housing and Local Government in London on 23 May.

Addressing the London Regional Conference of the National Housing and Town Planning Council he said: "The Ministry expects such dwellings to be heated throughout at a recommended temperature of 70°F. rather than 65°F. There is special provision in the new cost yardsticks to enable the authorities to obtain subsidy on the full cost of providing this and other amenities needed by old people. I should like to make this quite clear, because some completely mistaken things have been said about this matter in public."

# WILLIAM DAMON

We regret to record the death, on 8 July, at the age of 76, of William Damon, C.B.E. He was Chief Alkali Inspector for a record period of 26 years, and retired in 1955. On his retirement he became a member of the National Society for Clean Air.

He saw many changes during his time as Chief Inspector, and was liked and respected by his colleagues, the many people in industry with whom he came into contact, and by those in the clean air movement to which he devoted the keenest interest. He was an assessor to the Beaver Committee, and his advice was invaluable to the Ministry of Housing and Local Government in the framing and passage through Parliament of the Clean Air Bill. Since his retirement he had acted as a consultant and adviser on air pollution and chemical engineering matters.

He was well known overseas and visited and advised in many countries, and was chairman of the Air Pollution Working Party of the European Federation of Chemical Engineers. As Chief Alkali Inspector he did much to maintain and further build up confidence in, and the prestige of, the Inspectorate.

*New Circulars*

## SOLID SMOKELESS FUEL SUPPLIES

A new circular to local authorities has been issued by the Ministry of Housing and Local Government (28/67) and the Welsh Office (35/67) on the subject of consultation on the availability of solid smokeless fuels for proposed smoke control areas. The new arrangement supersedes that given in paragraph 13 of circular 69/63, in which local authorities were asked to consult representatives of various bodies about supplies of smokeless fuels before making smoke control orders.

For the new scheme, which came into force on 1 June, England and Wales have been divided into eight regions, in each of which a regional office of the Solid Smokeless Fuels Federation will be able to give, from one representative, comprehensive advice on the whole range of solid fuels. It will still be necessary for local authorities to consult separately the appropriate local officers of the Electricity and Gas Boards and, where necessary, the local distributors of oil products, about the supplies of their fuels.

The circular gives the names and addresses of the regional offices referred to, with references to the counties and districts, etc., covered by each office.

A similar circular has been issued by the Scottish Development Department (39/1967), in which is given the address of the S.S.F.F. regional office for Scotland, to which Scottish authorities should apply.

### Grant Arrangements—Scotland

The Scottish Development Department has also issued a circular (47/1967) on grant arrangements in smoke control areas. It is stated that supplies of Gloco will no longer be able to be guaranteed for future smoke control areas, although it is still available for existing areas. Supplies of other open fire fuels (the "premium" fuels) are expected to continue to be satisfactory for both existing and future areas.

It is no longer justifiable to withold grant on the replacement of an improved open fire either by an appliance capable of burning recommended hard coke, or by an approved gas, electric, or oil burning appliance. The works on which grant is payable are listed, and include an underfloor draught fire, fan assisted open fire, electric storage heater, direct-acting electric space heater, or a solid fuel, gas, or oil room heater.

The inclusion of direct-heating electric space heaters may be noted.

# GRIT AND DUST

## *Working Party's Report*

**Report of the Working Party on Grit and Dust Emissions. pp. 27. HMSO. 3s. net.**

**Grit and Dust. Ministry of Housing and Local Government, Scottish Development Department, Welsh Office. fcp. pp. 10. HMSO. 3s net.**

**Clean Air Act, 1956. Grit and Dust. Circular 52/67 (Min. of Housing and Local Government and Circular 23/67 (Welsh Office). HMSO. 5d. net.**

THESE three publications are linked. The first is the main report; the second a summary and memorandum based on the report and issued to local authorities; and the third is an explanatory circular also addressed to local authorities and calls on them, and especially those in the black areas, "to review all sources of grit and dust and to take all practicable steps to get the emissions reduced to acceptable limits".

The circular also states that "Authorities will shortly be empowered to require the measurement of emissions from furnaces covered by section 7 of the Act, i.e., furnaces burning pulverized fuel and those burning other solid fuel or waste at a rate of one ton an hour or more".

The Working Party which has produced the report was set up in September, 1964 to advise the Minister of Housing and Local Government on grit and dust emissions from industrial and other similar furnaces. Its terms of reference were: "To consider ways and means of measuring grit and dust emissions and to advise on the levels of emission admissible in relation to furnaces burning fuel equivalent to 100 to 50,000 pounds per hour of coal".

The Chairman of the Working Party was Mr. D. Hicks, until recently Director General of the British Coal Utilization Research Association. Mr. Hicks is to present a paper on the subject at the forthcoming N.S.C.A. Conference at Blackpool.

In its introduction the report states that it is not concerned with what emissions consistute a statutory nuisance within the meaning of the Public Health Act 1936, "in the almost infinite variety of circumstances encountered by local authorities. Our guiding principle has been to have regard to what is reasonable and practicable from an engineering and operational point of view and, in a general sense, to be sensible about the cost of meeting the standards. This is not in conflict with the spirit of the Clean Air Act 1956".

No practical investigations were undertaken, as these would have delayed the report, and "our conclusions are based on what was already known to us". Acknowledgment is made of the considerable quantitative data and experience made available by the National Industrial Fuel Efficiency Service.

It is recognized that there may be existing plant where to install grit arrestors or more modern firing equipment would involve costly works and impose hardship. In such cases regard should be paid to efficient operation of the plant: "the more efficient the plant the less is the amount of fuel used and correspondingly the less the amount of total emissions. But where the installation of new plant is concerned "there seems to us to be no good reason why our proposals should not be applied by all concerned".

The method of sampling is then described, and the cyclone probe method developed by B.C.U.R.A. is recommended because it is basically sound and has proved to be reliable in use.

The standards proposed are not

expressed in terms of grains per cubic foot because the solids concentration depends on the amount of dilution by excess air and by any air that may have infiltrated into the flue. The standard is stated in pounds per hour of grit and dust emitted in a period of normal operation, including peak loads. The amount of grit and dust expressed as a percentage of the fuel burned shall be greater for small plants than for big plants, and shall range between 0·5 per cent of the fuel burned at the upper limit of firing rate of 50,000 lb. fuel per hour and 1·0 per cent at and below a firing rate of 670 lb. fuel per hour.

The standards are stated graphically in terms of Maximum Continuous Rating (M.C.R.) expressed in lb. steam per hour from and at 212°F.

Chapter 2 deals with emissions from oil-fired boilers. Methods and principles are similar, though there are differences. The standards range from 0·4 per cent of the fuel burned with boilers with M.C.R.s up to 40,000 lb/h. to 0·2 per cent for boilers at the top of the range.

It is pointed out that emission of acid soot is a separate issue, on which it is hoped a satisfactory code of practice will be established, and that eventually it may be desirable to have a British Standard.

**Furnaces**

Chapter 3 is concerned with grit and dust emissions from furnaces, and it is said that this was the most difficult part of the Working Party's study. They have in fact been unable to put forward a comprehensive set of standards.

There are very few data of emissions from furnaces, and the problem is complicated by the large variety of furnaces, both in size and type. There is also the added complication that many different kinds of materials are heat treated. "Some do not change their properties during the heating process or materially add to the emissions, whereas others undergo physical and chemical changes in the furnaces and, in so doing, emit grit, dust and fume into the waste gases and some of this escapes into the atmosphere."

An attempt was therefore made to classify furnaces on the basis of the jobs they have to do and the kinds of material that are treated, and six broad classes are given—indirect and heating furnaces, for which standards are recommended, even though these are somewhat more tentative than for boiler standards. The other four classes are drying, sintering, and melting furnaces, and incinerators. It is thought that on these not enough is known about the various problems and accordingly a recommendation is made that the Ministry should initiate a systematic study to obtain emission data from a representative sample of these classes of furnaces. It is also recommended that N.I.F.E.S. should be chosen to carry out this investigation. Standards should be formulated by new Working Parties.

Chapter 4 is devoted to general observations, which are of a practical and informative nature—methods of sampling, facilities for sampling, the training of samplers, rapid methods and monitoring, and on the standards.

There is also a pertinent word of advice:

"No one is able to say with any degree of certainty what proportion of existing plants conform to the standards and how difficult it will be to bring within the standard those that do not conform. The trial period of three years that we have recommended should go some way to answering these questions. We have no hesitation in saying that for new plant installed from now on it should be a condition of approval that the plant is capable of meeting the standards, and industry should be advised that it should be part of the specification that the plant when reasonably operated will conform. Industry would be well advised to give themselves a factor of safety on these standards."

As mentioned, the standards are expressed graphically, and there are eight graphs showing the maximum emissions for installations of different sizes; namely, a chart for smaller and for larger installation for coal-fired boilers, oil-fired boilers, coal-fired furnaces, and oil-fired furnaces.

The Ministry's Memorandum "Grit and Dust" is in the main a summary of the Working Party's report, emphasizing the practical matters of procedure and technique as they will concern local authorities. The eight graphs of standards mentioned above are reproduced in this publication also.

The circular that has been sent to local authorities on this matter, in addition to mentioning the forthcoming regulations under section 7 of the Clean Air Act, points out that "There is little purpose in carrying out elaborate and costly measurements if the arrestment plant is not properly maintained and used. Any defects in maintenance and use of the plant should be eliminated before measurement of the emission is considered."

It also points out that when a local authority think measurement of an emission to be necessary, they should seek the co-operation of the firm concerned and arrange for the measurement to be carried out either by the firm or by the authority with the firm's permission. Authorities have no power under the 1956 Act to carry out measurements without the permission of the firms concerned.

# *Pollution in the Streets*

## Two New Reports

**Cars for Cities. Reports of the Steering Group and Working Group appointed by the Minister of Transport. pp. 107. HMSO, London. £1 1s. net.**

**Air Pollution from Road Vehicles. A Report by the Technical Committee of the National Society for Clean Air. pp. 44. NSCA, London. 3s. net.**

AFTER the publication of its report on *Sulphur Dioxide as an Air Pollutant*—which was very well received and has done a useful job—the Technical Committee of the Society undertook a similar study of another difficult problem, that of pollution from road vehicles. Other activities (including the international congress) delayed the completion of this work, but it has now been published, and will also be discussed at the Blackpool conference in October.

Only a few weeks before publication there appeared the Ministry of Transport report on *Cars for Cities*, which naturally also deals with the air pollution aspect of the road traffic question. Chapter 9 is in fact devoted to the subject, and there are also two appendices upon it.

At first sight, there was a little misgiving about our own report following so closely upon the official one, but examination and comparison of the two showed that our fears were unfounded and that the efforts of the Technical Committee had not after all been made redundant.

Visually, the N.S.C.A. report looks quite a poor relation compared with the large, glossy, two-colour illustrated pages of *Cars for Cities*. But our slim pamphlet has the advantage of being devoted wholly to the pollution problem, whereas the impact of what the other report had to say on this is inevitably overshadowed by the other vitally important matters it discusses.

From the point of view of intrinsic value and usefulness it is difficult to compare the two because of the differences in the ways in which they treat the subject. Broadly speaking, though, they are in agreement with each other, and each contains information that the other does not. The Society's report is perhaps the more forthright and direct in its conclusions, which it also summarizes in a helpful manner. It also carries a bibliography of the most important recent literature on the subject.

### Cars for Cities

The chapter on air pollution considers first the pollutants from engines and the nature of "atmospheric smog". Rather surprisingly it is said that the motor vehicle is almost entirely responsible for air pollution from carbon monoxide. But, as quoted in the N.S.C.A. report, Dr. Parker has estimated that out of an annual emission of about 12m. tons from all sources, about 5m. is from road vehicles.

The concentrations of pollutants in the streets and their significance are fully discussed, and there is an appendix on the health factor from the Air Pollution Research Unit of the M.R.C.

The causes of, and remedies for, pollution from internal combustion engines are then examined. There is also a separate appendix on the causes of pollution from diesel engines. The conclusions are similar to those made in the N.S.C.A. report: "The most important factor in preventing diesel engines from producing smoke is a high standard of maintenance".

And: "The combustion of smoke, with or without a catalyst, has also been explored, but without much success. The main reason is that not much of the smoke will burn because of the low exhaust gas temperature of most diesel engines; this also reduces the efficiency of any catalyst. We are satisfied that rather than attempting to find a cheap and practicable method of removing smoke after it has been formed, it would be better to avoid the creation of excessive smoke in the first place".

Anti-smoke additives are considered to be effective but have the danger that they may cause manufacturers to design engines to take advantage of their properties, and for them to continue to rate an engine as close to its smoke point as at present.

On existing legislation reference is made to an increasing number of successful prosecutions and to the number of prohibition notices served —13,500 in 1965—but the essential difference between a prosecution, by the police, and a prohibition notice, by a Ministry of Transport Examiner, is not made clear; nor are the effectiveness of the two procedures evaluated.

The only suitable method available for testing vehicles for smoke emission is said to be the free acceleration test used in Belgium and France. This has advantages and disadvantages, but it is concluded that the use of such tests would be a help in this country.

### Petrol Engines

The reduction of emissions from petrol engines is fully discussed, and improvements in carburettor design are noted, as well as the potential importance of the fuel-ignition system. After-burners are considered to be cumbersome, heavy, expensive and difficult to maintain, but may be a satisfactory way of reducing oxides of nitrogen when used with some other method of removing the hydrocarbons.

The possibility of using a different form of motor spirit is discussed, the most suitable probably being a liquid petroleum gas, such as propane or butane. It is pointed out that a quarter of the hydrocarbons emitted come from the crankcase breather. The cost of preventing this is low, and it is thought that all new petrol engines should be equipped—as some already are—with the means of preventing these emissions.

The conclusions on the petrol engine are:

"The petrol engine is the main contributor to air pollution from motor vehicles in this country and in view of the expected growth in car population, steps need to be taken to reduce the pollution from individual vehicles. We are satisfied that the petrol engine, operating on present fuels, is capable of being designed in a way that would reduce pollutants from it to an extent to meet conditions in this country."

Other forms of internal combustion engine are discussed, and the report goes on to consider the possibility of statutory limits for diesel and petrol engine emissions. For diesels it is proposed that a suitable smoke limit, under a free acceleration test and using a light obscuration smoke-meter of the BP/Hartridge type should be specified. For petrol engines, at this stage, and without the benefit of the further research that is needed, "the evidence now available suggests that for new vehicles, a maximum level of 3 per cent of carbon monoxide under idling conditions might be considered as an initial objective to be improved upon in due course".

The report then discusses the effect of vehicle size, traffic density, and journey speed on the level of pollution, and finally there is a section on the scope for reducing overall pollution levels. The general conclusions on this may be quoted in full:

"Speculation on the prospects of reducing carbon monoxide air pollution in, say, twenty years, might suggest reduction:

(a) of up to two-thirds of its present level by improvements in engine design;
(b) of up to one-half by a fairly widespread use of citycars*;
(c) of up to one-half by improved traffic flow.

"As these benefits are cumulative, the overall effect of all these changes would be a reduction to one-twelfth of the present level. Even if traffic flow were trebled in this period the benefit would still be a reduction to one-quarter of the present level—a very worthwhile improvement. We do not predict that anything like this will happen; we merely suggest these simplified calculations as pointers. And, of course, they do not take into account the further reductions that could come about from more widespread use of small diesel vehicles or of electric propulsion."

To sum up, this chapter of *Cars for Cities* is a most valuable and constructive survey of the problem of air pollution from road vehicles, with many constructive suggestions that should be followed up. We hope they will be, and that the importance of this aspect of the whole road traffic problem, vast and complicated as it is, will not be overlooked at any time in the developments and changes that must be accepted and put into effect.

### The N.S.C.A. Report

The Technical Committee report on the subject has, of course, the same end in view. The purpose of the study (in which the committee had valued expert advice) was primarily to analyse and clarify the problem, about which there has been much ill-informed thinking, and to indicate the lines on which progress can be made.

It is somewhat difficult to review the report here and now because it is to be the subject of discussion at Blackpool in October, when it will be introduced by the Chairman of the committee, Dr. Albert Parker. It would not be appropriate to anticipate his own review. As the report is priced at a mere 3s. it is hoped that many readers will purchase copies, but to those who will be attending the conference as delegates it should be mentioned that the report will be included, in full, in the preprints of papers they will be receiving.

Briefly, the report is divided into six sections: the nature and extent of the problem; pollution from petrol motor vehicles and technical methods of control; pollution from diesel motor vehicles and technical methods of control; legislative and administrative aspects of control; road vehicle pollution and town planning; and conclusions. In addition there are appendices on existing regulations, the motor vehicle control position in the U.S.A., and research on motor vehicle exhaust gases in the Federal Republic of Germany. There is also a bibliography.

Part VI, summing up the conclusions reached, is a most useful aid to the reader, and one wishes that something similar had been included in *Cars for Cities*.

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* "Citycar" is a term used in the report for very small cars that might be developed specifically for use in towns to reduce traffic congestion. The idea is fully discussed in Chapter 3.

In place of a critical review, therefore, at this stage, we append below the text of the Press release that was issued on the publication of the report on 22 August.

## NEED FOR CONTROL OF VEHICLE EXHAUSTS

Although at present more carbon monoxide and oxides of nitrogen are emitted from domestic fires and industry than from motor vehicles, this position could be reversed with the expected growth of road traffic unless steps are taken to control such emissions. This is one of the main conclusions of the 44-page booklet published by the Technical Committee of the National Society for Clean Air, *Air Pollution from Road Vehicles*.

In spite of the long delay, the Society anticipates that action will soon be taken in this country to reduce pollution from petrol motor vehicles. So far we have no legislation to control carbon monoxide fumes, of which cars are in any case the most important source at breathing level in our streets. Health effects of carbon monoxide emissions is the main problem in Great Britain.

For petrol engines, the Report regards modified carburettors and fuel injection systems as offering the most hope for reductions in carbon monoxide and hydrocarbons. Exhaust after-burners and catalysts are unlikely to provide the best solution. The way is now open for a standard European method of testing carbon monoxide emission and it is urged that the Ministry of Transport should fix limits for its content in exhausts. It is also suggested that exhaust gas analysis and carburettor adjustments should be included in annual car tests.

### Diesels: Criticism of British Standards

If all diesel engines were set to the level permitted by a forthcoming British Standards Specification, there would be even more diesel smoke on the roads than at present. The National Society for Clean Air feels compelled to protest at the smoke level adopted. "There is no point", states the Report, "in setting a standard if the smoke level chosen is appreciably above current practice with many existing vehicle engines."

Control of diesel smoke is mainly a matter of proper maintenance and it is urged that engines should be rated or set at a power output providing a reasonable margin below their tendency to smoke. It is considered that existing regulations provide an adequate legal basis for control and that:

"The method of spot checks on diesel engined vehicles, carried out by the Ministry of Transport Examiners in conjunction with the police, is a more effective method of control than police prosecutions. Taking vehicles off the road until the causes of smoke are remedied is a greater deterrent than mere fines."

### Town Planning

Discussing road vehicle pollution and town planning, the report admits that the control of emissions through planning measures cannot be dealt with in isolation. Where planning and reconstruction cannot be applied, restrictions on motor traffic in towns seem inevitable and might include "carless zones" and the banning of non-essential traffic from the centres of towns. The development of short-range battery-operated vehicles is regarded as being of particular importance to air pollution prevention and could revolutionize the transport problem in cities.

The report is available from the National Society for Clean Air, Field House, Breams Buildings, London, E.C.4 at 3s. net.

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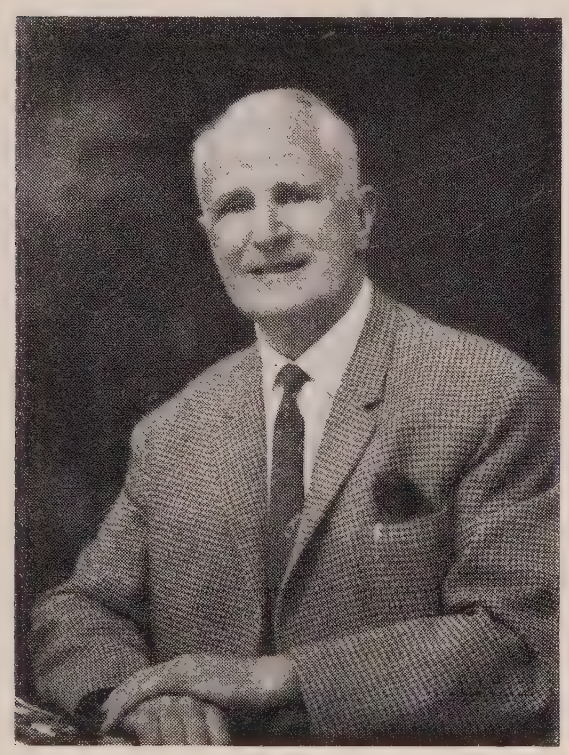
### Air Pollution Research

The Ministry of Technology announces a five-year air pollution research programme, costing an estimated £535,000, to be undertaken by the Atomic Energy Research Establishment, Harwell.

# Alfred Wade

*Presentation on Retirement*



At the Annual General Meeting of the East Midlands Division of the Society, held at Chesterfield on 12 July, Mr. Alfred Wade retired as Honorary Secretary. He had held the post for over 18 years, from the formation of the Divisional Council.

Mr. Wade retired as Chief Public Health Inspector for the City of Nottingham a few years ago, but had continued as Honorary Secretary to the Division that he had done so much to make successful and influential in the East Midlands region.

Councillor W. Everitt was in the chair, and he voiced the regret of all the members at Mr. Wade's decision, but said that this regret was equalled only by the great debt of gratitude felt by all for the efficient and seemingly tireless service he had brought to the affairs of the Division since its formation.

The members had subscribed to make a gift to Mr. Wade, and at the Chairman's request this was presented to him by the Director of the Society, Arnold Marsh. Mr. Marsh paid a warm tribute to Mr. Wade for the services he had rendered to clean air, not only as secretary to the Division, but also in the practical application of the aims and objects of the Society as C.P.H.I. for Nottingham, which had pioneered domestic smoke prevention long before the Clean Air Act.

Mr. Wade, in accepting the presentation—a cine-camera—referred to the inaugural meeting of the Division held in Nottingham in 1949, when 90 representatives from local authorities and private interests met members of the National Smoke Abatement Society, as it then was, to consider and agree upon the formation of a Divisional Council. He particularly referred to Councillor Mead as one of the representatives at that meeting, whose interest had continued throughout the years, and who had this year been elected to the national Executive Council. Mr. Wade acknowledged the help and consideration he had always received from the members during the years he had held office, and concluded by saying that while he had retired from high office it was his intention to continue his interest in the Society as an individual member.

In the election of officers that followed J. F. Edwards, Chief Public Health Inspector, Cambridge, was elected Chairman, and Councillor F. Brothwell, Bolsover U.D.C., was elected Vice-Chairman. In succession to Mr. Wade the new Honorary Secretary elected was G. Drabble, Chief Public Health Inspector for Chesterfield. H. N. Eardley was re-elected an Honorary Auditor, and V. Wales and W. R. Brownhill were re-elected as Scrutineers.

The business part of the meeting was followed by an informal address, or progress report by Arnold Marsh, which was followed by a paper on "Smoke Control—Progress and Problems", by John Wilson, Chief Public Health Inspector, Chesterfield R.D.C. Mr. Wilson's paper is reported on another page.

# THE 103rd ALKALI REPORT

## *1966 a Difficult Year*

**103rd Annual Report on Alkali, etc, Works. By the Chief Inspectors. 1966. pp. 77. HMSO. 7s. 6d. net.**

The annual Alkali Reports, now advancing into their second century, enjoy a world-wide seniority that alone entitles them to respect. But it is the contents of a report that counts, and here too they command admiration. We know of no other document that records so much practical and successful effort, over so wide a field, to control and minimize air pollution than do these slim volumes in their familiar rose-coloured covers.

Whatever the cover colour may symbolize, it is not the spectacles through which the Chief Inspectors view either their achievements or their problems. In the report for England and Wales F. E. Ireland bluntly states that 1966 was a difficult year for the inspectorate. He goes on:

"Air pollution control does not head the list of industrial priorities and at times of financial stringency, such as the country is at present experiencing, the response to our requirements is not always as enthusiastic as we would wish. There are several obvious reasons for their being a shortage of capital and naturally industry strives to make the most beneficial use of that which is available. Almost all sections of industry have been affected by the 'squeeze', but some of the weaker elements have been so badly hit as to have been forced to close down. In many cases stocks of unsold goods have been so high as to force reductions in throughput and even closure of works, some permanently. Further, schemes for expansion and development have been severely pruned or even cancelled. It is within this restrictive framework that we have had to pursue our task of getting industry to spend money on mainly unremunerative items of air pollution control . . ."

After explaining how the Act requires all new, registrable works to be fitted with the best practicable means for preventing emission of noxious and offensive gases, it is stated that "of the 56 classes of Scheduled Works presently registrable, 27 have been added between June 1958 and the end of 1966 and they have given the inspectorate probably its biggest task since its formation in 1863". Just prior to the onset of trade difficulties the stage was reached "where we finally decided what had to be done with certain difficult processes in industries such as iron and steel, ceramics, non-ferrous metals, etc.".

The report continues by discussing the basic attitude of the inspectorate towards such problems, and the importance of this makes it desirable to make another full quotation:

"Now we have been faced with one of those crises which occur from time to time in our history, and the inspectorate's attitude needs careful restatement. There is much personal judgment involved in its decisions, thus providing a subject for controversy with those who allow their fears and emotions, instead of facts, to rule their opinions. It is and always will be our policy to set as our target the highest possible standard of air pollution prevention. The ideals for which we strive are not always achievable practicably at the time decisions have to be taken and one only has to look back over the years to see how standards have improved with time, technical know-how and public demands. There will be no slackness in our endeavours to achieve perfection, but practicable means have to be tempered to suit the times and we will continue to administer the Alkali Act in that helpful spirit which began with the first inspector and has continued ever since. This does not mean that we are soft with industry, for we firmly believe that more is achieved by co-operation than by coercion and that the inspectorate catalyzes the modernization of works processes. The present trading difficulties should be temporary, whereas equipment installed now will probably have to last fifteen or twenty years or more and it would be wrong to accept sub-standard units with such a long life. The public must be protected, not just to satisfy present-day standards, but for the improved living conditions of future decades."

Further on Mr. Ireland writes:

"These delays in enforcing remedies may be unpalatable to residents with unsatisfactory local emission problems. The expression 'best practicable means' takes into account economics in all its financial implications and we interpret this not just in the narrow sense of a works dipping into its own pockets, but including the wider effect on the community. In the long run it is not the owners of the works who pay for clean air, but the public, and it is our duty to see that money is widely spent on the public's behalf. The country's, industry's and work's current financial situation have to be weighed against the benefits for which we strive and careful thought has to be given to decisions which could seriously impair competitiveness in the national and international markets. Never do we lose sight of our ultimate goal—that all scheduled works shall operate harmlessly and inoffensively and that this state shall be attained at the earliest possible moment."

## Statistics

Among the many facts and figures recorded in the report is that the total number of visits and inspections during 1966 was 10,771, of which 310 were to or in connection with works not registered under the Act. 54 were in connection with control of radioactive emissions and seven were concerned with colliery spoilbanks.

The number of works concerned in specific complaints investigated during the year, largely at the request of local authorities, was 350. Of these 269 were works registered under the Act and 81 non-registered. Degree of justification varied, comments the report. Complaints against registered works were most numerous against ceramic works (40), electricity works (35), gas and coke works (31), iron and steel works (27), aluminium works (14), cement works (13), metal recovery works (12), and tar works (10).

The number of infractions in 1966 was seven, compared with 19 in 1965. These were with respect to sulphuric acid (contact process) two, nitric acid one, copper one, gas and coke one. For the second year in succession two infractions have been recorded against 1958 Order processes for failure to use "best practicable means". In all cases formal notification of the infraction was made by the inspector and remedies applied, so that there was no need to institute legal proceedings.

Some lighter colour is afforded in the section on unregistered works. In one instance complaint about a fishy odour was traced to faulty electrical wiring in the complainant's own house, and in another case there was an allegation of damage from solvent and sulphurous vapours to leaves of nearby trees. Although the complaint was legitimate investigation showed that the damage was due to severe infestation with caterpillars of the satin moth.

## Roadstone Pollution

Nearly a page is given to discussion of a problem about which there is a rapidly growing volume of complaint—grit and dust from the winning and treatment of roadstone. This is obtained almost exclusively from quarries in the northern and western parts of the country, from where it is exported by ship, road, or rail to other parts of the country.

"Because of this export trade the industry in the west is highly organized into large groups and the trend within the industry is to concentrate production into larger units. Some of the quarries are very big industrial plants using the latest chemical engineering techniques to crush, grade, dry and coat stone and a typical limestone installation in Somerset will produce 3,000 tons per day of dry stone, plus 2,000 tons per day of coated material. Drying or coating plants involve treating waste gases at rates of about 30,000 cubic feet per minute and when this is coupled with a growing demand for denser types of road surface incorporating large quantities of fines, there is a major dust emission potential."

Drying and preheating for coating is usually done in oil-fired kilns and heaters, and dust entrainment can be up to 100 grains per cubic foot. Simple cyclone for removal are inadequate and should be followed by bag filters or wet arrestors. Although several works are satisfactorily treating their emissions, and there is generally co-operation when there are complaints, the volume of complaints is growing rapidly. A target of 0.2 grains per cubic foot has been suggested and conditions are satisfactory when this is achieved.

### Registered Works

The registered works reported upon cover chemical and allied industries, metal industries, fuel industries, and other industries—a very wide field indeed, upon which general comment is difficult. Of especial interest might be mentioned the section on paraffin oil works, iron and steel works, and electricity works.

The amount of petrochemicals produced in the United Kingdom, in tons of carbon content, has risen from 60,000 in 1950, to 1,151,000 tons in 1966, and it is expected to approach three million in 1968. "Increases in crude petroleum refining tell only part of the story, because many refineries are installing large new plants for the further processing of crude fractions. With these are associated large new boiler plants of power station size with chimneys ranging up to 500 feet." The report mentions that "one large development was held up for a while because of difficulty in reaching agreement with the Ministry of Aviation, who were anxious to safeguard a training airfield in the area. Later in the year a similar problem arose over the height of a chimney for a petro-chemical project in the same area. Airfield safeguarding regulations have recently become more stringent and unless care and discrimination are exercised the policy of dispersing from tall chimneys gases which cannot be arrested is likely to be severely affected".

The section on iron and steel discusses in particular the growth of electric arc furances in this country, the new oxy-fuel technique, and problems associated with the hot blast cupola foundry process.

Cement works dust emissions are reported to be improving, and further improvements are anticipated. It is stated that two new cement works in areas of great natural beauty in the North East and the Peak District have both operated well and have given no cause for public complaint.

We were pleased to see that the paper given by Dr. E. A. J. Mahler, Deputy Chief Inspector, to the International Clean Air Congress in London last October has been reprinted as an appendix to the report. This, on "Standards of Emission under the Alkali Act", was one of the most important contributions to the congress.

### The Scottish Report

The report for Scotland, by the Chief Inspector, Dr. E. A. Balfour Birse, follows the report for England and Wales, and is very much shorter. The Inspectorate—now known as the Chemical Inspectorate—made however 662 visits and inspections during the year, 432 being to works under the two Alkali Acts that govern control in Scotland. There are 244 premises registered under the Act and it is reported that complaints about them were not numerous.

On these the report says: "When complaints are received they are investigated as soon as possible both in the interests of the complainers and in fairness to the managements under complaint. Delay after an event under complaint only confuses the issue for all parties concerned. In most cases we believe that events under complaint were either explained to the satisfaction of the complainers or a remedy found. As always, however, there remain some which can be solved only in the long term".

Particular reference is made to the work done by the department's dust testing team. During the year 19 works were visited and 257 tests were made. On this work the report says:

"Survey of dust emissions from registered premises has been in progress now for about five years. Subject to limitation of scale, the survey measurements confirm much of what the Inspectorate has thought desirable in dust emission control. Need for reliability in performance of dust arrestment plant stands out almost before all. Increases in maximum arrestment efficiency accompanied by loss in general reliability are just not worthwhile. Again, while electrostatic precipitation rightly stands high as a means of controlling dust emission, our measurements of actual performance shows that regular attainment of rated performances must not be presumed."

As in the England and Wales report, the survey of the registered processes, individually, indicates how much close attention is given to a large number of very diverse chemical and engineering problems.

The number of inspectors, as listed, is 26 for England and Wales, and three for Scotland.

## ALKALI ACT PROSECUTION

Prosecutions under the Alkali &c. Works Act are so rare that special interest attaches to one taken recently in the Midlands.

The case was heard at Eccleshall Magistrate's Court on 7 July, 1967, when the firm of T. A. Simpson, of Ankerton Farm House, Eccleshall, near Stoke-on-Trent, was prosecuted, after several warnings, for operating a registrable "Metal Recovery Works" without securing registration under the Alkali Act. Such works became registrable under the Act by virtue of the Alkali, &c. Works Order, 1963, now incorporated in the consolidating 1966 Order.

The defendant pleaded guilty and was fined £10 for the first, £20 for the second, and £40 for the third of three offending occasions, plus 15 guineas costs.

In a comment to this journal on the case the Alkali Inspectorate say:

"This prosecution is only our third case since 1920. As you know, prosecution is not the answer to many of our problems where we and others are toiling to find adequate technical solutions, but where appropriate prosecution is not lost sight of and we will not hesitate to take legal action where necessary. Many times in the past we have reached the stage of taking legal action, but opposition has collapsed and there have been no court proceedings because the matter has been otherwise satisfactorily resolved. Trade Associations also play a big part in persuading recalcitrant members to conform because, naturally, apart from anything else, they do not care for some members to be apparently favoured or advantageously placed whilst others comply."

# THE AIR POLLUTION INVESTIGATION

## *Eight Year Report Published*

**The Investigations of Atmospheric Pollution, 1958-66, 32nd Report. Warren Spring Laboratory, Ministry of Technology, pp. 146. HMSO. 10s. 6d. net.**

This long-awaited report has at last appeared in print, and as it has been extended to 1966 it is fully up-to-date. Some of the material it contains has been published earlier, including papers to various conferences, but it is valuable to have it all brought together in a single (and well-produced) volume. The Warren Spring Laboratory is to be congratulated on the fact that instead of pages and pages of detailed figures, it has written what is virtually a textbook on the science and art of air pollution investigation, in which many aspects of the subject, additional to measurements, are examined. A large amount of practical information is packed into the report, of interest to general readers, and of essential importance to students of the problem and its techniques.

The detailed tables of observations that filled most of the preceding reports (going back over half a century) have been eliminated because they are now included in the monthly Bulletin, which no longer has a "Confidential" restriction upon it. In addition, it is mentioned that there are also available annual Tables of Observations, which may be obtained free of charge from W.S.L.

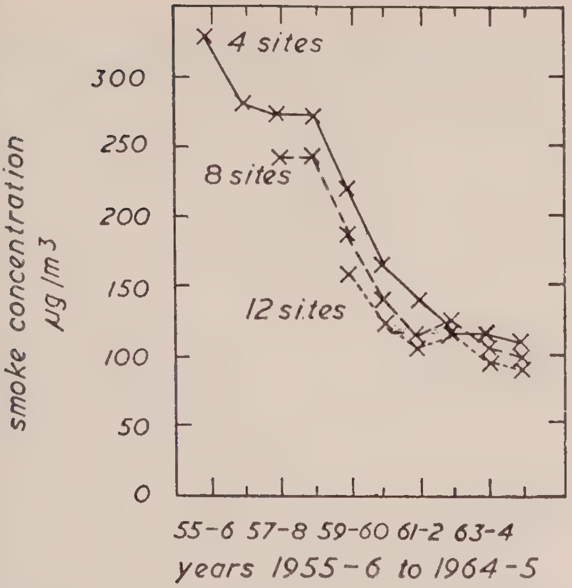
To quote from the introduction, the report is arranged in sections "starting with the emission of pollutants and its abatement, and proceeding, through the dispersion of pollutants, to the observed distribution of pollutants".

The chapter on the abatement of emissions deals with research undertaken at the Laboratory, and includes a full description of the Reinluft process for the removal of sulphur dioxide from flue gases, and of the work done on this. After preliminary tests on a pilot plant "further tests were therefore planned to make the operation of the plant more nearly representative of full-scale practice. A number of operating difficulties were encountered and before the process could be recommended for industrial application it would be necessary to make a full economic assessment of a redesigned plant incorporating chemical engineering improvements suggested by the pilot-scale tests. No further work is contemplated at this stage, and the pilot plant has been dismantled".

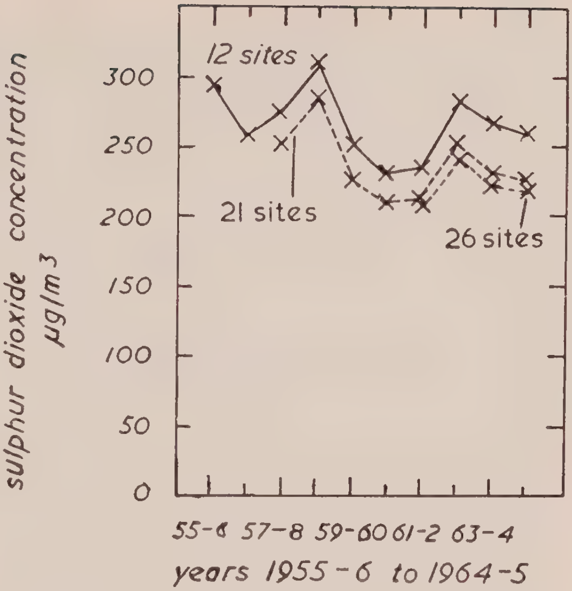
In this chapter there is also full discussion on the work done on the removal or prevention of smoke from diesel vehicles, and a section on the problem of acid soot from oil-fired boilers. On the latter, mention is made of an advisory panel set up in 1961 to assist when a first approach to the oil supplier did not lead to a cure. The conclusion reached is that "while there still seems to be ample scope for improved operation in many oil-fired boilers, it is only fair to report that since the formation of the advisory service on acid soot not one complaint has had to be referred to the panel. This says much for the technical services of the oil companies".

The chapter on the dispersion of pollutants is largely concerned with chimney heights, and the findings of the Working Party set up by W.S.L. are recorded—this material was used as one of the bases for the *Memorandum on Chimney Heights*.

A chapter on Dispersion of Pollutants in Towns is of importance, as is one on the Effects of Weather on Pollution, which discusses in particular the London smog episodes of 1952 and 1962.



*Trends in smoke concentration at London sites*



*Trends in sulphur dioxide concentration at London sites*

There is a full account of the planning of the National Survey of Pollution and this is followed by a chapter on Trends in Pollution. Particularly important is the examination of trends in London between 1955 and 1965. Smoke concentrations have fallen dramatically since 1955, by about two-thirds. The rate of decrease is now slowing down. The change is shown graphically in the adjoining figure, and, as the report says, "these curves form a striking tribute to the active smoke-control policies of the London Boroughs since the Clean Air Act came into force".

The reduction in sulphur dioxide concentration, shown in the other figure, is less striking than that for smoke, but it is still a distinct decrease, which, to quote the report, "is even more interesting as it was achieved in the face of a very marked and continued increases in emission. It must be taken as a tribute to the wise re-planning of London insofar as chimney heights, location of industry, etc., are concerned".

A further chapter is useful in a practical way as it describes and discusses methods of measurements. Finally, there are appendices which include a list of the organizations co-operating in the investigation, and a list of organizations carrying out research on air pollution. The latter list, covering government establishments, nationalized industries, research associations, universities, colleges, etc., and private industry, is surprisingly long.

## ALKALI WORKS ORDER

It is noted that we omitted to record a New Alkali etc. Works Order, 1966, which came into operation on 1 December, 1966 (S.I. 1966, No. 1143; H.M.S.O., 1s. 6d. net), and do so now because of its special importance.

The discharge of certain noxious or offensive gases from certain types of work is subject to control under the Alkali etc. Works Regulations Act, 1906. The original list of gases and schedule of works subject to control have been extended by seven previous orders made between 1928 and 1963; and control under the Act of 1906 was extended to smoke, grit and dust by section 17 of the Clean Air Act 1956.

The new order revokes these previous orders and consolidates them in a single list and schedule. Two alterations are made in the list of gases and two in the schedule of works, and these are printed in italics in the new order.

# The Growth of Nuclear Power

*From a Paper by*

**Sir William Penney, K.B.E., F.R.S.**

BOTH coal-fired and nuclear power stations are producing electricity at a cost lower than that predicted in 1955. But Britain's most modern type of commercial nuclear power reactor will have generating costs at least one-tenth cheaper than those of a contemporary coal-fired station.

This was one of the points made by Sir William Penney, K.B.E., F.R.S., Chairman of the United Kingdom Atomic Energy Authority, when he delivered the annual Citrine Lecture to the British Electrical Power Convention meeting at Eastbourne on 23 May. In a lecture entitled "Nuclear Power", Sir William reviewed the progress of the nuclear power industry since 1955 and outlined some possible lines of future development.

Recalling that the scene for British advance in this field was set by the 1955 White Paper, "A Programme of Nuclear Power", Sir William said: "The 1955 prediction of 0·6d./unit for both coal-fired and nuclear stations represents 0·8d./unit in 1966 currency. Both types of station have in the event done better than this. Coal-fired stations coming on power about 1970 are expected to have a generating cost of about 0·55d./unit and the costs of the Wylfa nuclear station will be about the same figure on assumptions about station lifetime and load factor which we in the Atomic Energy Authority consider to be justifiable on the basis of our experience. Even on conservative assumptions for these factors, the A.G.R. stations which will follow will have generating costs about one-tenth cheaper than contemporary coal-fired stations—a gap which will widen as the A.G.R. programme develops".

He added: "As a result of technological advances, especially the size factor, the generating cost of electricity from large coal-fired stations coming on line in the next few years will, allowing for inflation, be about three-quarters of what was predicted in the 1955 White Paper, while Advanced Gas-Cooled Reactor stations, even using cautious ground rules, will generate at even lower figures. If the potential for development in the A.G.R. system is achieved, generating costs on base load in today's terms will come down to about 0·35d./unit. Putting this in another way, fifteen years' work on nuclear power will have reduced the generating cost of electricity to about half of what was thought possible at the beginning of the period and the following decade should reduce it to one-third".

Sir William had this to say about possible competition from natural gas: "It is possible that nuclear stations may have to compete with another indigenous fossil fuel in the form of natural gas, if the reserves of natural gas under the North Sea turn out to be so large that a substantial surplus and adequate reserves can be assumed after all demands for direct burning and as a chemical feed stock have been met.

"The key factor here, of course, would be the price at which the gas was made available to the power station. My own view is that a natural gas base load station would not be competitive with a large A.G.R. with the improved parameters achievable for stations going on power in the mid-1970's, unless gas could be delivered to the station at about 2¼d./therm implying, of course, a landed price below that figure. This is on the basis of applying the same ground rules to each station, i.e.

75 per cent load factor and 20 years lifetime."

Reminding his listeners that, according to present plans, Britain would have 13,000 Megawatts of nuclear generating capacity by 1975, Sir William said: "This programme appears modest when we look at nuclear programmes and plans in some other countries. During a single year—1966—firm orders for no less than 15,000 Megawatts have been placed in the United States. Per capita, Canada has a programme as large as ours".

"Provided its price is competitive", he continued, "it seems to me that the great flexibility of electricity would make it a preferred form of energy for an ever widening and growing market. To a considerable extent, the growth of the electricity market depends on nuclear power. In my talks with Research and Development people, with manufacturers and utilities in the United States, Canada, several countries of the European Economic Community and Japan, I have not met anybody who is not expecting electricity demand in his country to double about every ten years for at least another two cycles, with nuclear power taking a substantial part of the new capacity."

### Four Systems

In addition to its achievement with the Advanced Gas-Cooled Reactor, Britain had a strong position in three other systems: the Fast Breeder Reactor; the Steam Generating Heavy Water Reactor; and the High Temperature Reactors.

The first commercial fast reactor station was likely to be on line in about ten years' time. The United Kingdom was expected to be the first nation to reach this position. "Partly because of its low fuel costs the fast breeder reactor is expected to generate electricity more cheaply than any other system" said Sir William. "Once the programme is under way, stations with reactors of about 1,000 MW. should generate at about 0·3d. per unit, and later stations should do even better. The target for a 2× 1,000 MW. station with favourable ground rules ordered towards the end of the seventies should approach a farthing a unit, in terms of today's values."

The Authority believed that the S.G.H.W. reactor would—in the medium size range—be an effective competitor in the export market. Because some countries had a preference for natural (rather than "enriched") uranium fuel, the Authority were working to extend the capability of the S.G.H.W. system to natural uranium. They were already collaborating with colleagues from Australia on this work and New Zealand might join in also.

Work on a High Temperature Reactor was being carried out in co-operation with a number of Western European countries under the auspices of O.E.C.D. The cost estimates for this reactor were "extremely interesting", although they could as yet be regarded only as tentative.

### European Co-operation

Making a strong plea for European co-operation in nuclear development, Sir William said: "Even with our own reactor development programme, involving only a few types, we have to make difficult choices when deciding how to deploy our limited resources to the best effect. Obviously they must not be distributed over such a wide field that we do not make effective progress in any one of them. On the other hand by narrowing our effort too much we could miss a possible winner.

"The same problem arises in the development programmes of different countries . . . Rationalization on a world—or even on a hemisphere—basis would obviously be Utopian, but it is not perhaps unrealistic to hope and work for some rationalization on a European basis. An agreed allocation of projects among the European countries, and subsequent sharing of results, would increase the total benefit obtained from the total investments of the individual countries to everyone's advantage. A whole range of different problems would have to be solved—political, industrial, technological and personal; but speaking as a European technologist, I can only describe the present overlap and replication of R. & D. effort on nuclear power, and the probability of seeing more plants built than can be economically used, as prodigiously wasteful."

On the question of export prospects, Sir William said: "The growth of nuclear power around the world provides opportunities for exports; but the nature of export business as seen by exporting countries appears to be changing. The original concept was that a successful nuclear station could be exported as a turnkey contract. There will still be opportunities for exports in the form of a turnkey contract; but most countries embarking on nuclear power stations seek to take the opportunity of educating their own industry, wherever possible, and to minimize the expenditure of foreign exchange. Thus, the nuclear export business is likely to be largely confined to licensing arrangements and contracts for specialized items, such as fuel material or complete fuel services, electronics and control devices and some other items specific to a reactor type. In brief, the export business in most components for nuclear stations is becoming similar to that for conventional power stations. Only the fuel services remain special".

# *Smoke Control Problems*

## Regional Surveys from Yorkshire & East Midlands

*Below are reported two recent papers, one by W. Jennings, M.A.P.H.I., M.Inst.P.C., Chief Public Health Inspector, Brighouse, speaking at a meeting of the West Riding of Yorkshire Clean Air Advisory Council; the other by John Wilson, D.P.A., F.R.S.H., F.A.P.H.I., A.M.I.P.H.E., Chief Public Health Inspector, Chesterfield R.D.C., presented at a meeting of the East Midlands Division, N.S.C.A.*

### W. JENNINGS

In his review Mr. Jennings at the outset rightly stressed the hopes and anticipations of progress in the Beaver Committee Report of 1954 and then posed the question, what can be reported nationally and locally as constituting progress?

Dealing firstly with fuels, the review contains a table showing bituminous coal consumption in 1952 and 1965, with figures familiar to the readers of the *Clean Air Year Book* and showing a reduction of consumption by a quarter in the domestic field, four-fifths on the railways and almost a half in industry resulting in a 50 per cent reduction in smoke pollution. It is interesting to note a further grouping known as miscellaneous which has *increased* by almost one-third. This grouping which represents efficient coal consumption includes power stations using coal for electricity generation now running at 69·3 million tons per year with no dark or black smoke problem.

It is also noted that in 1966 less than 25 million tons of bituminous coal was being used annually in domestic fires whereas in 1952 the amount was almost 37 million tons. The gratifying increase in the use of solid smokeless fuel from three million tons in 1938 to almost eight million tons in 1965 is noted alongside the significant increase in the use of gas and electricity which provides the bulk of the increasing domestic fuel supplies—to the extent of the equivalent of 21 million tons of coal.

Mr. Jennings refers to the uncertainty of supplies of the new solid smokeless fuels; having been told that the date of their initial introduction was "rather flexible within the confines of a limited period". He stresses the value of these fuels to clean air progress provided they were available and retailed at a reasonable price but deplores the development cost of £12m. on "Homefire" which is still at least a year away from achieving its production target of 650,000 tons annually at the Coventry plant.

He goes on to deal with the problems of solid smokeless fuel availability, most "shortages" being due to transport difficulties or unwillingness to stockpile reasonable quantities and envisages the decreasing quantities of gas coke being channelled into early smoke control areas and the disappearance of one serious problem as smoke control expands—the sale of bituminous coal in smoke control areas.

Tribute is paid to the role of oil in improving the atmosphere as far as smoke is concerned. Its tremendous impact is shown by the increase from two million tons in 1938 to almost 39 million tons in 1965. The marketing of oil and solid fuel has improved he considers, but further progress must be made in pre-packed solid fuel delivery to give it a 20th Century appearance.

Natural gas, expected to provide 10 per cent of our total energy requirements by 1970 prompts this quote from Lord Robens, "its proposed use in electricity generation is the economics of the mad house when this is just the place where indigenous bituminous coal can really be used efficiently". The fuel section ends with a reference to the possibility of nuclear energy displacing imported oil for electricity generation.

### Domestic Smoke and Smoke Control

Mr. Jennings next reviews domestic smoke control progress and points out that it was responsible for 82 per cent of all smoke in 1965 as against 56 per cent in 1956—a pointer to the greater success achieved in removing smoke from other sources. He considers that administratively the tools have been adequate and refers to the Ministry confirming areas very quickly where there is no appeal. Policy change regarding the checking of solid smokeless fuel availability has been helpful and the run down in coke production is described as a blessing in disguise. Progress cannot be as speedy as was hoped because of increased costs. The table of black area premises covered, also familiar to readers of the *Clean Air Year Book*, will surely encourage a contrary view to that expressed by Mr. Jennings—"one could reasonably expect progress to be not quite so speedy"—this because of increased costs.

A survey of progress in Yorkshire follows and includes a gratifying reference to progress in the coal-mining belt and miners described as now the best advocates of the Clean Air Act. The author points out that although conferences and meetings seem to be preoccupied with this aspect of clean air progress most of the West Riding industrial cities and towns will be smoke controlled before the end of the next ten years.

### Industrial Smoke and other Provisions of the Act

Industrial smoke, grit and dust and miscellaneous provisions of the Act are dealt with as they operate in Yorkshire and a useful table of industrial smoke contraventions shows reductions over the past six years that justify the comment over industrial premises being included in smoke control areas without any worries because of the tremendous improvement that has taken place. The West Riding, alone with Middlesex, has secured registration to control the burning of industrial waste.

### Conclusions

After discussing motor vehicle pollution and sulphur dioxide Mr. Jennings gives a survey of the practical results of eleven years of the Clean Air Act. Dr. S. Craxford of Warren Spring Laboratory is quoted as saying that the City of London, for long completely smokeless, is 23 per cent better than the surrounding areas. Improvement generally is given as between 22 per cent and 40 per cent in smoke pollution as a result of smoke control and Teeside and Sheffield are mentioned for their greatly improved atmosphere.

The part played by the West Riding Clean Air Advisory Council is reviewed and the author concludes with a warning that we are sharing "in one of the greatest social exercises of all times", one that has been dealt with more quickly than the other public health problems of clean water, clean food, water borne sanitation or slum clearance.

## J. WILSON

Mr. J. Wilson began his address to the East Midlands Annual General Meeting at Chesterfield on 12 July, 1967 by quoting the percentage of black area premises covered by confirmed smoke control areas given in the Society's Year Book for 1966-67.

The figure, only 32·8 per cent, meant that a further 20 years would elapse before black areas were fully covered, in fact a glance at target dates made one wonder whether this would be long enough. Why was there a lack of progress? Then followed an attempt to set down a few of the problems in the hope that authorities would re-examine their attitudes to smoke control and embark on a more progressive policy.

This group, said Mr. Wilson, embraced the few who did not believe in the necessity of smoke control because they considered there was no problem or it was marginal or the cure worse than the disease. Their existence would not justify him restating all the evidence in support of the necessity for smoke control as the reasons were really excuses, voiced to cover up misgivings or a desire to carry on in the status quo.

### Staff

The Report of the Working Party on the Recruitment, Training and Qualifications of Sanitary Inspectors (H.M.S.O. 1953) showed that only 1·3 per cent of the total time of all Inspectors was spent on smoke abatement duties. Smoke control work cannot be a spare time job fitted in when there is a slackening off in other duties. Once you start a smoke control order through its sequence of steps to operation, a flow of work commences which cannot easily be stopped, and for this reason it is better to decide on a programme and allocate staff to this work.

Chesterfield Rural District Council had a small section of four dealing with all smoke control work:

1 Senior Smoke Inspector (Public Health Inspector), 1 District Inspector (Public Health Inspector), 1 Technical Assistant (male), and 1 Survey Assistant (female) to achieve a declared aim of areas covering around 3,000 houses per annum. This was equivalent to 750 premises per person per annum. Mr. Wilson then reminded his audience of the shortage of qualified Public Health Inspectors, and advocated the use of technical assistants under the control of a qualified Public Health Inspector, to speed the local authorities progress.

### Coal Mining Areas

Mr. Wilson then gave details of coal production and said the areas in which coal mining has been the chief employment look on smoke control with scepticism. The producers of solid smokeless fuels tell us that it takes one ton of coal to produce 16 cwt. of coke etc., so that in fact a change over to solid smokeless fuels should not mean a decreased demand for coal.

The main threats to the demand for coal came from oil and natural gas. In smoke control areas gas as a domestic fuel was attractive and if solid fuels are to maintain their share of the market then the appliances must be well designed, have eye appeal, purchase and running costs must be at least comparable and the fuel must be readily available.

The problems related to concessionary coal allowances should be cleared up once and for all. If the Ministry of Housing and Local Government, the National Union of Mineworkers and the National Coal Board could make clear statements, preferably in one document, many local authorities representing mining communities would push ahead with smoke control work.

### Supplies and Distribution of Solid Smokeless Fuel

The shortage of these fuels was one of the criticisms of and objections to smoke control. The arrangements contained in Circular 25/67 whereby assurances are sought from an officer co-ordinating supply statistics is an improvement and a local authority would feel happier in stating that supplies of solid smokeless fuels will be available.

The speaker then described the West Midlands Gas Board "milk round" delivery without any pre-ordering of requirements as being something on the lines of what was required. Bread, vegetables and other household necessities could be obtained in this way, and if solid fuel distributors could find a similar marketing method then one of the objections to solid fuel would be removed.

The sale of solid fuel in 28 lb. bags was uneconomic for the householders but a useful service which could have possibilities. Fuel merchants who find that the vehicles and men they employ cannot cope with the winter rush, might set up temporary sales offices. A man in his car or the lad with a "pram" could collect a bag to tide the family over until the proper delivery takes place. Merchants and distributors should re-examine the service they give.

### Finance

Mr. Wilson gave details of average costs to an authority when carrying out installations. These varied from a cost of £12 8s. to £63 18s. per house while more recent orders show that the cost per house has risen to £88 11s. 4d. He calculated the charge per house per annum for 10 years as £3 8s. which was less than the cost of a polluted atmosphere estimated at £10 per head in the black areas and £5 elsewhere. To put the charge in prespective the cost per house is less than three half pints of beer per week or less than one cigarette per day. This great social revolution in house heating was no different from any other major reform—it cost money. The cost was not so heavy as to be burdensome and was well worth while.

### Procedure

The Ministry of Housing and Local Government have made attempts to simplify smoke control area procedure and had been most helpful in dealing with problems which arose, being even willing to dicuss and advise in order to ensure the free running of the machinery of smoke control. There was little to be done to improve the existing procedure. A new look should be taken at the whole problem by those who through legislation regulate procedure.

Mr. Wilson would like to see the law amended so that it reads a local authority "shall" submit proposals and be required to define black area(s) on a map and submit a scheme showing how this area will be brought under smoke control within a period of say 10 years. Any authority which is of the opinion that this is impracticable should be required to give reasons. This would require an examination of future fuel demands and in all probability the various Boards would welcome such information and be of help to the appliance manufacturers.

A further amendment would be that any person proposing to install an improved appliance should qualify for grant. A modern solid fuel appliance will burn fuel more efficiently and therefore contribute to a reduction in pollution and should be encouraged. The anomaly that by housing improvements a 50 per cent grant is available towards the cost of an appliance and by smoke control 70 per cent should be

*Concluded on page 39*

# SMOKE CONTROL AREAS

## Progress Report

### POSITION TO 1 JULY, 1967—TOTALS

| | England | Wales | Scotland |
|---|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation | 44 | — | 1 |
| *Acres*, 3,400 | | | |
| *Premises*, 41,060 | | | |
| **Smoke Control Areas in Operation** | 2,157 | 5 | 79 |
| *Acres* | 520,036 | 418 | 35,071 |
| *Premises* | 2,810,892 | 2,352 | 204,945 |
| **Smoke Control Orders** | | | |
| *Confirmed* | 310 | 1 | 26 |
| *Submitted* | 55 | — | 5 |
| **Grand Totals** | 2,566 | 6 | 111 |

*The lists below are supplementary to the information in the last issue of "Smokeless Air" (Summer 1967) which gave the position up to 1 April, 1967. They now show changes and additions to 1 July, 1967.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.*

### NEW SMOKE CONTROL AREAS IN OPERATION

**Northern**

*Tyneside and Wearside*

Gateshead C.B. No. 8. Hebburn U.D. Nos. 4, 5 and 6. Hebburn U.D. and Jarrow B. (Monkton Hall). Tynemouth C.B. Nos. 1 and 2.

*Teeside*

Darlington R.D. No. 2. Middlesbrough C.B. (Lodore, Mandale & Levick).

**Yorkshire**

*West Riding (North)*

Aireborough U.D. No. 20. Baildon U.D. Nos. 7 and 8. Batley B. No. 5. Bradford C.B. (Wyke). Brighouse B. (Slead Syke No. 11). *Elland U.D. No. 2. Elland U.D. (Stainland No. 2). Halifax C.B. No. 13. Horsforth U.D. Nos. 23 and 24. Keighley B. No. 6. Leeds C.B. Nos. 58 and 59. Ossett B. No. 9B. Sowerby Bridge U.D. No. 3. Spenborough B. No. 7.

*West Riding (South)*

Darton U.D. No. 4. Rotherham C.B. Greasbrough No. 1. Sheffield C.B. No. 16. Swinton U.D. Nos. 11 and 12.

**North Western**

*South Lancashire and North-East Cheshire*

Ashton-under-Lyne B. No. 7. Cheadle and Gatley U.D. No. 8. Denton U.D. No. 9. Eccles B. No. 7. Farnworth B. (Plodder Lane South). Manchester C.B. (Whalley Range). Manchester C.B. (Knott Mill). Manchester C.B. (Liverpool Road). *Manchester C.B. (Withington). Oldham C.B. No. 9. Prestwich B. No. 7A. Rochdale C.B. (Buersil and Kingsway). Stalybridge B. (High Street, Set Street, and Hollings Street). Stretford B. No. 9. Whitefield U.D. No. 6.

*Central Lancashire*
Darwen B. No. 2. Preston C.B. No. 16.

*Merseyside*
Bebington B. No. 10. Bootle C.B. No. 8. Liverpool C.B. Nos. 19 and 20. Runcorn R.D. No. 1.

**Midlands**

*Derby, Nottingham and Chesterfield*
Carlton U.D. No. 2A. Chesterfield R.D. No. 7. (Killamarsh). Sutton-in-Ashfield U.D. No. 1. 1966.

*North Midlands*
Leicester C.B. No. 16.

*West Midlands*
Aldridge U.D. No. 26. Birmingham C.B. Nos. 128, 131, 133-138. Halesowen B. No. 27. West Bromwich C.B. No. 16. Wolverhampton C.B. (West Central Area). Wolverhampton C.B. Nos. 7 and 8. Wolverhampton C.B. Nos. 10A, 11 and 12.

*Potteries*
Kidsgrove U.D. No. 11. Newcastle-under-Lyme B. No. 6.

**London**

*Greater London Boroughs*
Barnet L.B. No. 3. Bexley L.B. No. 7. *Croydon L.B. No. 8. Ealing L.B. Nos. 26 and 27. Enfield L.B. No. 13. Hammersmith L.B. No. 9. Harrow L.B. No. 12. Hillingdon L.B. Nos. 4 and 5. Lambeth L.B. Nos. 16 and 17. Southwark L.B. No. 18. Westminster L.B. (Readings). Waltham Forest L.B. Nos. 10 and 11.

**Local Authorities Outside the Black Areas**
Crewe B. No. 3. *Gillingham B. No. 4. Rochester B. No. 3. Rugby B. Nos. 2, 3 and 5. Slough B. No. 10. Staines U.D. No. 7. Thurrock U.D. No. 4. Warwick B. (Lodge Wood Estate). *Whitley Bay B. No. 2. Wortley R.D. (Middlewood and Wadsley).

## NEW ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*
Boldon U.D. Nos. 1-5. Gateshead C.B. No. 10.

*Teeside*
Billingham U.D. No. 5. Darlington R.D. (Newton Aycliffe No. 3). West Hartlepool C.B. No. 7.

**Yorkshire**

*West Riding (North)*
Baildon U.D. No. 9. Brighouse B. (Bridge End No. 12). Elland U.D. Greetland No. 2. Halifax C.B. No. 14. Leeds C.B. Nos. 64, 65 and 66. Queensbury and Shelf U.D. No. 6.

*West Riding (South)*
Darton U.D. No. 3. Darton U.D. Nos. 10, 11 and 12. Dearne U.D. (Bolton-upon-Dearne, No. 1). Sheffield C.B. No. 4.

**North Western**

*South Lancashire and North-East Cheshire*
Bolton C.B. (Ladybridge). *Bury C.B. No. 6. Cheadle and Gatley U.D. No. 9B. Crompton U.D. No. 4. Eccles B. No. 8A. Farnworth B. No. 2. Manchester C.B. (Burnage). Oldham C.B. Nos. 11-14. Prestwich B. No. 7B. Rochdale C.B. (Falinge and Spotland). Royton U.D. (No. 3. Thornham). Sale B. No. 8. Salford C.B. No. 13. Swinton and Pendlebury B. No. 5.

*Central Lancashire*
Brierfield U.D. No. 2. Colne B. No. 5. *Preston C.B. No. 17. Preston C.B. Nos. 18-20.

*Merseyside*
Bebington B. No. 11. St. Helens C.B. No. 5. Widness B. No. 7.

**Midlands**

*Derby, Nottingham and Chesterfield*
Carlton U.D. No. 2. Derby C.B. No. 11. Hucknall U.D. No. 1. Long Eaton U.D. (Wimpey Estate No. 2). Long Eaton U.D. (Lyndon Ave.). Sutton-in-Ashfield U.D. Nos. 2 and 3, 1966.

*North Midlands*
Leicester C.B. No. 17.

*West Midlands*
Bedworth U.D. No. 1. Birmingham C.B. Nos. 88, 113, 139-143. Dudley C.B. (Brierley Hill No. 27). Dudley C.B. (Brierley Hill No. 28). Dudley C.B. Nos. 49 and 51.

**London**

*Greater London Boroughs*
Brent L.B. No. 4. Bromley L.B. Nos. 4-6. Croydon L.B. No. 9. Ealing L.B. Nos. 30 and 31. Haringey L.B. (Tottenham No. 7). Haringey L.B. (Hornsey No. 9). Haringey L.B. (Wood Green No. 10). Merton L.B. No. 6. Southwark L.B. Nos. 19-22.

*Outer London*
Dartford B. (Temple Hill South). Dartford B. (Area No. 6).

**Local Authorities Outside the Black Areas**
Blackburn C.B. No. 7. Brentwood U.D. No. 6. Exeter C.B. (Whipton No. 1). Exeter C.B. (Stoke Hill No. 2). Exeter C.B. (Cowick Lane No. 3). Exeter C.B. (Carlyon Gardens). Grantham B. No. 12. Hemel Hempstead B. (Chaulden No. 1). Kings Lynn B. (Fairstead). *Lancaster

C.B. No. 4. Oxford C.B. No. 6. Rochester B. No. 4. Rugby B. No. 8. Slough B. No. 11. Whitley Bay B. No. 3.

### NEW ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Tyneside and Wearside*

Felling U.D. Nos. 3 and 4.

*Teeside*

Stockton-on-Tees B. (Hartburn No. 1).

**Yorkshire**

*West Riding (North)*

Bradford C.B. (West Bowling). Morley B. Nos. 29, 34 and 35. Rothwell U.D. No. 11.

**North Western**

*South Lancashire and North-East Cheshire*

Heywood B. Nos. 7A and 8. Kearsley U.D. No. 2. Rochdale C.B. (Deeplish and Stoneyfield). Salford C.B. No. 15. Stockport C.B. (Hollywood/Heaton Lane). Stretford B. No. 11.

*Central Lancashire*

Accrington B. Nos. 6 and 7. Padiham U.D. No. 8.

*Merseyside*

Liverpool C.B. No. 26. St. Helens C.B. No. 5A.

**Midlands**

*Derby, Nottingham and Chesterfield*

Derby B. No. 13. Mansfield Woodhouse U.D. No. 1.

*West Midlands*

Halesowen B. Nos. 28 and 29. Sutton Coldfield B. No. 10. Walsall C.B. Nos. 10-12.

**South West**

*Bristol*

Bristol C.B. No. 8.

**London**

*Greater London Boroughs*

Ealing L.B. No. 32. Enfield L.B. No. 13. Kingston-upon-Thames L.B. Nos. 11 and 12. Merton L.B. No. 7.

**Local Authorities Outside the Black Areas**

Chatham B. No. 5. Cheltenham B. Nos. 2 and 3. Grantham B. No. 13. Todmorden B. No. 6. Watford B. No. 7.

### SCOTLAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

Port Glasgow No. 1.

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Falkirk No. 5. Renfrew Burgh No. 3. Stirling County (Carron etc.).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Dundee (Law).

### WALES

### NEW SMOKE CONTROL ORDER CONFIRMED BUT NOT YET IN OPERATION

Mold U.D. No. 2.

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## MEETING WITH U.S. PLANT ENGINEERS

A European Study Tour on Air and Water Pollution, by members of the American Institute of Plant Engineers, is to end with visits in England, and with a meeting that has been arranged to be held in London on 2 October. The meeting is being sponsored by the London Branch of the British Institution of Plant Engineers, in association with the National Society for Clean Air, and organized by Dennis Parkes, editor of the journal *Maintenance Engineering*.

The meeting, to which members of the N.S.C.A. are invited, is to be held at the Royal Society of Arts, John Adam Street, London, W.C.2, at 6.30 for 7.00 p.m. It will be of an informal, discussion, nature, and on the platform will be a panel of British representatives in the fields of both air and water pollution. Among them will be Dr. Albert Parker, who as a former director of both the Water and the Fuel Research Stations, speaks for both subjects. Other air pollution representatives will be F. E. Ireland, Chief Alkali Inspector, and Arnold Marsh, N.S.C.A. Director. On the water pollution side there will be D. W. Jobbins, Trade Effluent Officer of the G.L.C., and D. H. A. Price, Senior Chemical Inspector, Ministry of Housing and Local Government.

The meeting should provide an interesting opportunity for a two-way exchange of useful information and opinion.

# Smoke Control Areas

### Summary of Progress as at 30 June 1967

| (1)<br>*Region* | (2)<br>*No. of acres covered by smoke control orders confirmed or awaiting decision* | (3)<br>*Percentage* of total black area acreage in the region so covered* | (4)<br>*No. of premises covered by smoke control orders confirmed or awaiting decision* | (5)<br>*Percentage of total black area premises in the region so covered* |
|---|---|---|---|---|
| Northern .. .. | 22,230 | 17.74 | 104,470 | 18·89 |
| Yorkshire and Humberside | 121,460 | 32·25 | 410,980 | 35·19 |
| East Midlands .. | 37,180 | 12·98 | 122,555 | 23·94 |
| Greater London .. | 180,920 | 55·32 | 1,615,525 | 61.21 |
| North Western .. | 124,560 | 31·05 | 583,695 | 34·28 |
| West Midlands .. | 63,690 | 25·58 | 271,465 | 25·82 |
| South Western .. | 7,200 | 27·33 | 26,650 | 17·89 |
| Totals (black areas) | 557,240 | 31.41 | 3,135,340 | 40·32 |
| Outside black areas (all parts) | 96,699 | | 333,928 | |
| GRAND TOTALS | 653,939 | | 3,469,268 | |

*The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of a black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country).

*Note*

Statistics in respect of Wales and Monmouthshire are no longer included.

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*Concluded from page 35*

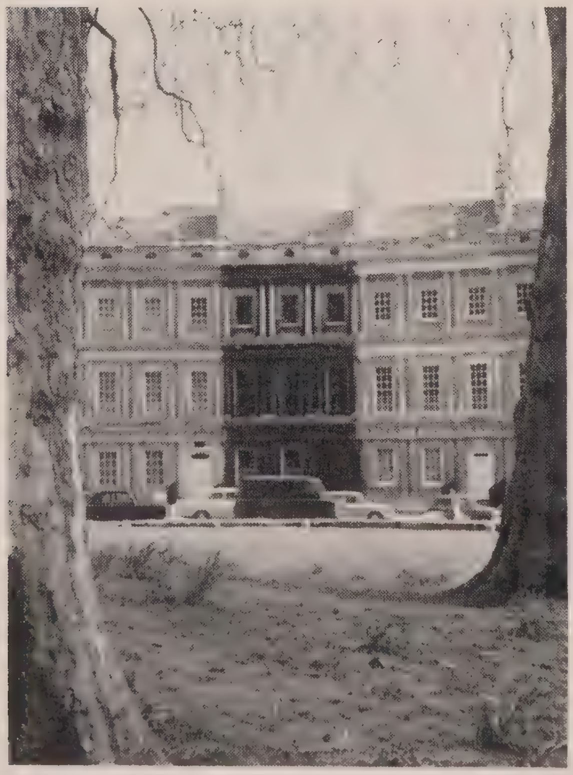
removed and it would be necessary to specify that the appliance was of a type suitable for burning the fuels likely to be available in a smoke control area.

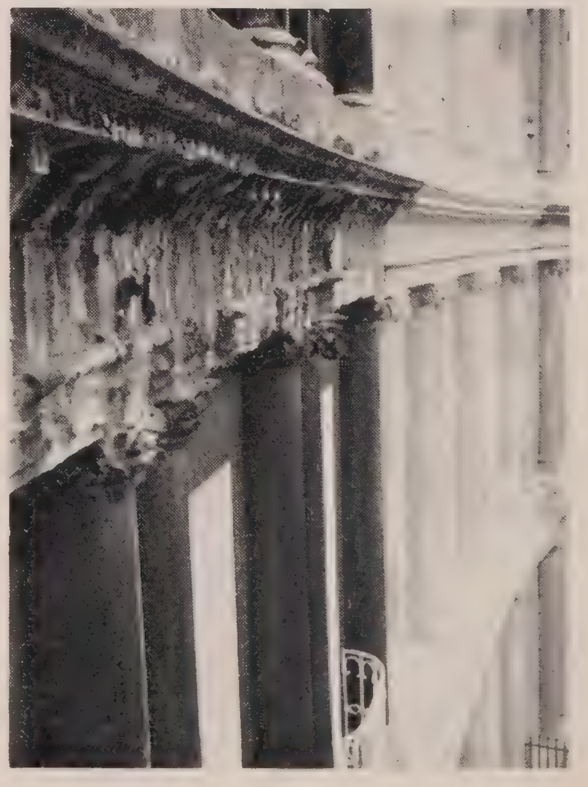
Mr. Wilson concluded by summarizing his recommendations:

1. Make a programme of smoke control compulsory within the black areas. Each authority to submit proposals.
2. Allow grant on all conversions of appliances subject to the appliances being suitable for use in a smoke control area.
3. A clear statement on concessionary coal to be made.
4. Solid fuel distribution to be examined with a view to the consumer receiving a better service.
5. Local authorities to re-examine their existing programmes and staffing position so as to improve progress.
6. A fuel policy to be determined so that coal mining areas can be re-assured as to the future of the industry.

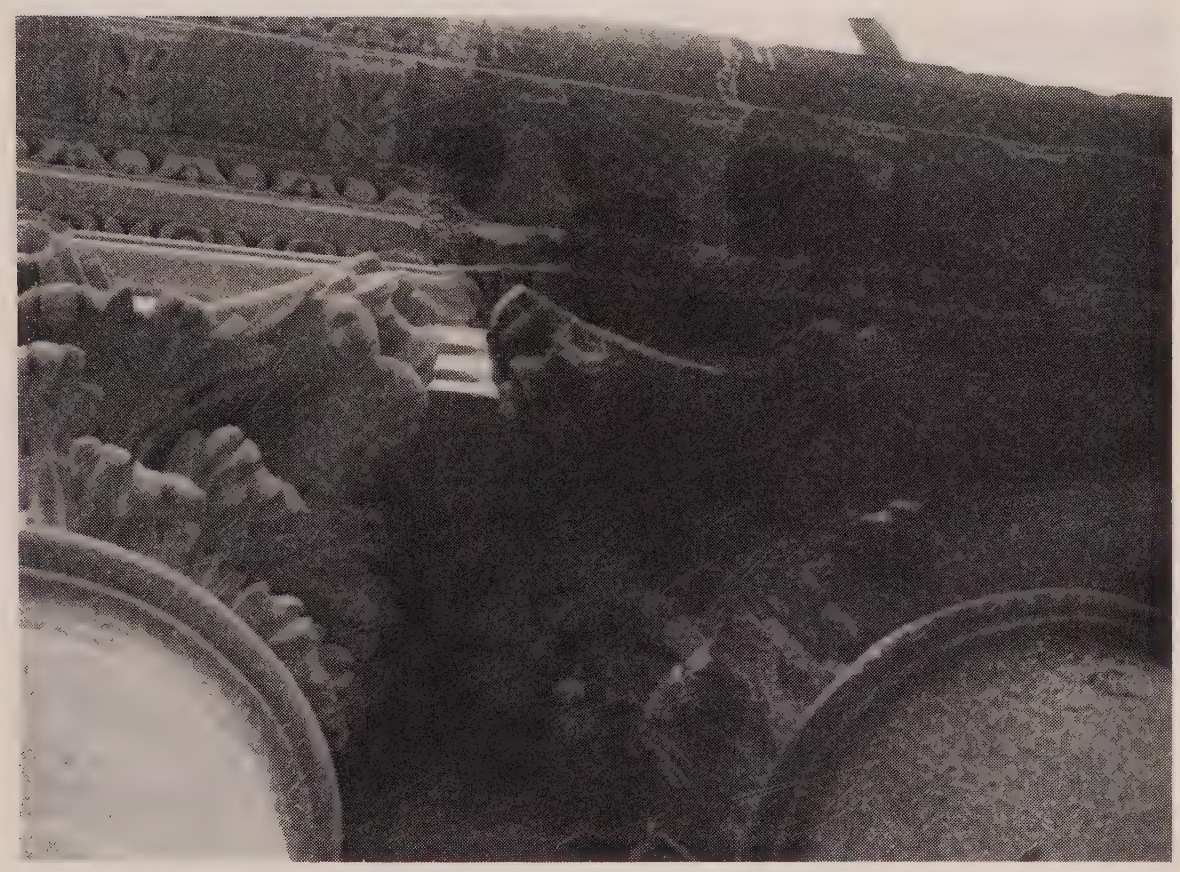
He distributed a valuable set of appendices to complement his address.

# *The City of Bath*





# Gets Rid of its Grime



*We are indebted to Mr. Brian Davis, City Architect, and to the planning staff, Bath, for these striking photographs of the cleaning and restoration of the fronts of the houses in the architecturally famous Circus. Bath has little industry, and the grime being removed is undoubtedly mainly from the coal fires of the houses themselves and others in the neighbourhood.*

# *INTERNATIONAL SECTION*

*U.S.A.*

## APCA's Cleveland Conference

*by*

*Harold M. Englund**

The Air Pollution Control Association brought its sixtieth annual meeting to a successful conclusion with three records established. These were: the highest attendance in the Association's history—2,300 delegates; the largest number of exhibitors of control equipment and instrumentation—78; and the most ambitious technical programme—198 papers and panels presented under 34 major subject sessions.

The conference, held in Cleveland, Ohio, from 11-16 June, 1967, gave concrete evidence of the great public and scientific interest in the United States and Canada in understanding and controlling air pollution.

### Highlights

The meeting got off to an excellent start on Monday, 12 June, when Dr. John T. Middleton, director of the National Centre for Air Pollution Control, delivered the keynote address. His talk summarized the status of air pollution control from a federal viewpoint and underscored the request by the President of the United States for a proposed Air Quality Act of 1967.

The morning's programme also treated the delegates to a showing of the three-screen Canadian film, "A Matter of Attitudes", produced by Crawley Films. On hand to introduce the timely, imaginative film was Edgar Sarton, film consultant and writer of the Montreal produced television show "Counterpoint".

Featuring the well-known interview team of Patrick Watson and Laurier Lapierre, the film dealt with the public's attitudes toward air and water pollution and their degree of awareness of the quality of the environment.

Dr. Christopher E. Barthel, Jr., executive director of the Research Foundation of Kansas, was introduced as the new president of the International Union of Air Pollution Prevention Associations. Dr. Barthel announced that Arnold Arch, executive secretary of the Air Pollution Control Association, had been elected secretary of the International Union, and that the Second General International Conference of the International Union would be held in Washington, D.C., during the period 8-13 December, 1970.

Finally, achievement was recognized and honoured when Arnold Marsh, director and secretary of the National Society for Clean Air of Great Britain and first secretary of the International Union of Air Pollution Prevention Association, received the A.P.C.A.'s Richard Beatty Mellon Award which is presented to an individual "whose contributions of a civic, administrative, technical or other nature have aided substantially the cause of air pollution control".

The Mellon citation said, in part: "Arnold Marsh has devoted his entire effort over a 38-year span to campaigning for clean air. His leadership throughout the world in air pollution

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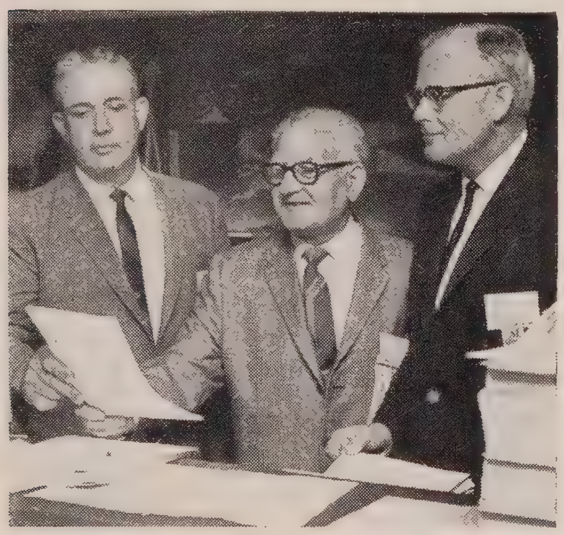
* Assistant Executive Secretary, APCA, and Editor of the Association's Journal.

*James H. Huguet, A.P.C.A. President, presents the Mellon Award to Arnold Marsh*



*James H. Huguet with Albert W. Locuoco, Conference Chairman and Cleveland's Commissioner of Air Pollution, and the incoming President, Robert L. Stockman*

control work has been recognized for many years as an engineer, a writer of an excellent treatise and countless articles on smoke abatement, and editor of the respected quarterly journal, *Smokeless Air*. He played a major role in shaping the International Union of Air Pollution Prevention Associations, assisted in framing the body's constitution, and nurtured the infant international body from its inception in 1964".

A.P.C.A., in turn, was honoured by Mr. Marsh's appearance at the President's Luncheon and by his humorous and very gracious speech of acceptance.

Recipient of an honorary membership in A.P.C.A. was Lawrence M. Roberts, director and consultant, Research-Cottrell, Inc., Bound Brook, New Jersey. This membership is conferred on a person "of widely recognized eminence in the field of air pollution control", one who has "rendered especially meritorious service to the Association".

**A.P.C.A. News**

Elected president of the Air Pollution Control Association at its sixtieth annual meeting was Robert L. Stockman, executive secretary of the State of Washington Air Pollution Control Board in Seattle.

He succeeds James H. Huguet, industrial conservation co-ordinator, Ethyl Corporation, Baton Rouge, Louisiana.

Stepping into the office of first vice president, president elect of the organization, is John S. Lagarias, president of Resources Research, Inc., Reston, Virginia.

Re-elected as vice president was Joseph W. Mullen, manager of air pollution control division, National Coal Association, Washington, D.C.

Two new vice presidents elected were W. Brad Drowley, director of air pollution control for the Ontario Department of Health in Toronto, Canada, and Victor H. Sussman, director of the air pollution control division, Pennsylvania Department of Health, Harrisburg, Pennsylvania.

A 14-page detailed summary of the annual meeting is published in the August 1967 issue of the Journal of the Air Pollution Control Association. This issue also contains a call for technical papers for the 1968 annual meeting which will be held during June 23-28 in St. Paul, Minnesota.

See you there?

## MORE U.S. NEWS

### The Federal Role

To readers who are interested in the greater responsibilities on air pollution control being undertaken by the Federal Government, why this is necessary, and why it is also necessary to win the acceptance and support of this policy by the States and Cities, may be recommended a recent paper "The Federal Role in Air Pollution Control". By John T. Middleton, Director of the National Centre for Air Pollution Control, this clear and persuasive exposition of the situation was a paper read at a Kentucky Air Pollution Conference in May last, and has been printed in booklet form by the Public Health Service, Department of Health, Education, and Welfare, Washington, D.C.

### Car Firms Meet Federal Standards

Secretary of Health, Education, and Welfare John W. Gardner announced on 14 July that five automobile manufacturers have met Federal air pollution control standards for 1968 models and predicted that all will do so in time to meet production schedules. The 1968 models are the first to which Federal standards apply.

The five manufacturers who have been certified as in conformity with the standards are: Ford Motor Company; Toyota Motor Co., Limited; Dr. Ing. H. C. F. Porsche K.G.; Nissan Motor Co., Limited; and S.I.C. Automobiles Peugeot.

The certification applications of 35 other manufacturers are in various stages of completion, awaiting submittal of additional test data by the manufacturers.

### Vortex Rings and Low Chimneys

Dr. Timothy Fohl, a Boston physicist, has proposed the emission of stack gases and smoke by the formation of vortex rings from quite low, and large diameter, chimneys. Even with the 1,000 ft. chimney, he says, smoke can rise no higher than 2,500 ft. With the smoke ring technique a 30 ft. stack could push the contamination 10,000 ft. up before it disperses.

"Once you get this vortex ring formed," he is reported, "it's a nice stable flow and it inhibits mixing. A vortex ring is the most stable form you can get for moving one mass of fluid within another."

The chimneys need only be between 15 and 30 ft. high for average-size power plants, he estimates. They would be about the same diameter as their height.

A piston or shutter would be arranged to release the smoke in puffs as many as one a second, like a smoker blowing smoke rings. The rings would penetrate inversion layers and would not be affected by any but the strongest winds.

### Air Pollution and Athletic Performance

The Journal of the American Medical Association (20 March, 1967) reports a study made in California which offers strong evidence for the unfavourable effect of oxidant air pollutants on long-distance runners. Records of cross-country track teams were compared with air pollution data over a six year period, and there was a significant correlation found between such air pollution levels and the performances of the athletes.

Correlations with pollutants other than oxidants, such as total suspended matter, carbon monoxide, or oxides of nitrogen, were not observed, nor did temperature, relative humidity, wind velocity or wind direction show any relationship to performance.

The oxidizing compounds thought to be responsible are those that arise from photochemical reactions of motor fuel combustion products—the Los Angeles smog. Such reactions are not experienced in Britain and other temperate European countries.

### The Fogbroom

*Time* magazine (14 July, 1967) reports interesting experiments on the dispersion of fog or smog, stemming from observations made on the way in which fog droplets were observed to condense on nylon lines at the Northern University of Chile. Following this up, Wesley Bellis, research director of the New Jersey department of transportation, set up a research group, which finally evolved a "fogbroom", a 30 by 48 inch aluminium frame strung with half a mile of nylon thread and rotated at 86 r.p.m. by a base-mounted motor. In a research chamber in which a prime New Jersey fog can be simulated, a row of fog-brooms substantially thinned a test fog in a minute and completely cleaned it up in five minutes.

It is thought that the moving nylon filaments jog the minute fog particles together, causing them to combine into water droplets large enough to drip down the threads. To test the brooms outside the laboratory, the New Jersey researchers have set up 20 in a field outside Trenton and equipped them with photoelectric devices that start their motors when a fog settles in. If they effectively clear a corridor through the fog the devices will probably be placed in operation along a stretch of highway five miles west of the Lincoln tunnel that is frequently shrouded in fog.

*The Netherlands*

### SULPHUR DIOXIDE—ACCEPTABLE LEVELS

The Research Institute of Public Health Engineering (Instituut voor Gezondheidstechniek TNO), Delft, has published an English version edition of their Report G300—"Sulphur Dioxide: to what level is it acceptable?". The authors are L. J. Brasser, P. E. Joosting and D. van Zuilen. It is a bound volume of 47 foolscap cyclostyled pages.

The diagrams it contains, with a short summary of the essentials, were shown at the exhibition at the International Clean Air Congress in London last October, and copies of this material have already been sent to those who envinced their interest.

This is a very thorough and carefully reasoned survey and report, and is an important contribution to the literature on the subject. After considerations concerning the outlining of standards, it discusses the occurrence and determination of $SO_2$, the technical principles of air pollution measurement, the influence of the pollutant on plant life and vegetation, and then upon the human organisms. It then reviews existing guides and standards for $SO_2$ in other countries, and finally makes observations (or recommendations) concerning $SO_2$ guides for the Netherlands. There is also a very useful bibliography.

A note issued with the report draws attention to the publication, since it was completed, of the U.S. Public Health Service report on "Air Quality for Sulphur Oxides" (reviewed in our last issue), and comment is made on the surprising congruency between the two reports.

The sections on the effects of $SO_2$ on plant life and on man, the survey of standards in other countries, and the threshold values proposed, are of particular interest and will be valuable to those studying this still complex and unresolved aspect of air pollution.

The report is not priced, and inquiries about copies should be made to the Research Institute at Schoemakerstraat 97, Delft, the Netherlands.

*Federal Republic of Germany*

### Motor Exhaust Control Postponed

An article which appeared in *Die Welt* of 26 June, reported that the Federal Republic's plans to incorporate devices in motor vehicles to reduce exhaust emissions have been postponed for the time being. However, the Federal Ministry of Transport is drawing up plans to control the emission of unburnt gases from the crankcase.

### Munich Conference

The VDI-Kommission Reinhaltung der Luft announces that a three day conference is to be held in Munich from 24 to 26 October under the title "Schwerpunkte der Emissionsbekämpfung" (literally, the centre of gravity of the campaign against emissions).

### Second Düsseldorf Exhibition

A further congress and exhibition under the title "Clean Air" is being organized to be held in Düsseldorf between 9 and 13 June, 1969. They will be held under the auspieces of the VDI-Reinhaltung der Luft, with the co-operation of other organizations and the DüsseldorferMessegesellschaft mbH—"Nowea".

*Japan*

## PHOENIXES AND FIREFLIES

Two unusual aspects of the effects of air pollution have just come from Japan. One says that a pair of "ho-o" birds, the famed bronze sculptures at the Byodoin Temple in Uji city will soon disappear from the top of the temple to be stored away in its treasure house. The worsening air pollution is forcing their "disappearance" a temple spokesman said. The severe erosion of the bronze phoenixes has turned their surfaces whitish. Alarmed, the temple decided to replace the sculptures, designated as national treasures, with plastic replicas.

The other account is that fireflies—a symbol of classical Japan—are dying out in the country, as part of the price of industrialization. Smog is said to be the chief culprit, but polluted rivers and chemicals used in rice paddies are also blamed.

Also from Tokyo there is a dispatch about traffic policemen on point duty at busy, smog bound intersections complaining of headaches, nausea and vomiting. They are now being provided with ten minutes of pure oxygen (states the report) from special inhalers immediately after leaving the area.

### Sulphur Removal

Under pressure of a clean-air campaign, several Japanese refiners have followed *Idemitsu Kosan* in disclosing definite plans to install heavy-oil-desulphurizing plants. Their processes, however, differ somewhat from the Idemitsu project, which will employ direct desulphurization of the total heavy-oil bottom fraction. The new systems are all designed with a vacuum unit to separate the lighter-grade heavy oil from the bottom and then to reblend the two after the lighter grade alone is desulphurized.

Idemitsu has already started work on its 40,000-bbls./day desulphurizing plant at Chiba, using *Universal Oil Products*' Isomax process. The \$16·9-million plant is due onstream in September.—*From Chemical Week, New York.*

*Malta*

The Malta Clean Air Bill was approved by the House of Representatives on 16 June.

*World Health Organization*

The Regional Office for Europe of W.H.O., in collaboration with the Government of Czechoslovakia, is organizing a Symposium on the Health Effects of Air Pollution, which will take place in Prague from 6 to 10 November next.

*Italy*

An industrial filter, which it is stated may be a breakthrough in controlling smog caused by industrial gases and smoke, is made of "Moplen" plastic. Developed by Montesud Petrochimica, Largo Donegani 1, Milan, the unit uses naphtha as the active agent. It is claimed to remove 96 per cent of sulphuric and sulphurous anyhydride from furnace smoke, and to be adaptable to every type of installation using combustion.

*Mori Closure*—The Italian Health Ministry has finally ordered Montecatini-Edison to close 30 of the 60 electrolytic cells at its 19,000 tons-per-annum aluminium smelter in Mori, near Trento, on the grounds that the new installation to reduce the air pollution affecting the nearby town of Chizzola has proved ineffective (*Smokeless Air*, Summer, 1967, p 229). The Ministry has also urged Montecatini-Edison to rectify the cause of the pollution.

*South Africa*

Johannesburg's first smoke control zone, covering the whole of the central area of the city, has been approved by the Provincial Executive Committee.

# *Electric Vehicles*

## Survey by Lord Wakefield

The annual report of the Electric Vehicle Association, published in May, shows that registered battery electric road vehicles at the end of 1966 are estimated at over 55,000—a production increase of nearly 3,400 for the year.

Lord Wakefield of Kendal was re-elected President of the Association at the annual general meeting on 11 May. Speaking at a luncheon that followed Lord Wakefield said:

"The past year has been outstanding for the amount of attention and interest that battery electric passenger cars have received and continues to receive in the press, and this of a world-wide nature", said Lord Wakefield of Kendal, President of the Electric Vehicle Association, at the Association's Annual Luncheon in London on 11 May.

"One of the items which got the greatest publicity was the announcement by the Ford Motor Company of the U.S. about their development work in connection with a new electric car and a very exotic type of battery", went on Lord Wakefield. "It is interesting to note that the development work on the car itself is being done by the British Ford Company, presumably because they consider that we in Britain know more about electric vehicles than anyone else in the world.

"The sodium-sulphur battery on which Ford are working is certainly not yet out of the laboratory stage and I am told by the experts in the battery world that it is their opinion that it may well be quite a long time before it does emerge as a practical proposition with knowledge of cost and life in a variety of operating conditions.

"When this stage is reached it will, of course, make a very big difference to the range of the electric vehicle."

Lord Wakefield said that there had been other announcements in the United States of work on a zinc-air battery and some further developments with the silver-zinc battery. The former of these needed much more development yet but was probably further advanced than the Ford sodium-sulphur cell. The silver-zinc cell suffered mainly from extremely high cost and, so far, from short life.

"It should be appreciated that all the batteries to which I have referred so far are types which have to be recharged electrically and as such are of direct interest to our friends from the Electricity Council," he said. "There is a body of opinion, particularly in this country, which considers that the ultimate solution to the passenger electric vehicle problem—and I stress the word 'passenger'—is the final emergence of the fuel cell as a practical low cost power producing unit.

"Work on fuel cells is going on throughout the world," said Lord Wakefield, "but no one so far has solved the problem of how to use low-cost fuels, such as fuel oil, or natural gas in compact high efficiency units such as would be required for a small road vehicle.

"Whether the fuel cell battery will emerge before the other types I have mentioned is anybody's guess, but it should be appreciated that when it does it will solve the problem of rapid refuelling which is really so essential for a versatile transport system.

"These matters are, however, very much in the future and unlikely to affect the commercial vehicle and the industrial truck business for a good many years to come."

Lord Wakefield reported that active membership of the E.V.A. had increased, overall production in the industry had gone up and the financial

**Better things are electric**

*Issued by the Electricity Council, England & Wales*

value of exports had also increased.

### Improving Urban Environment

E. C. Williams, Chief Scientific Adviser to the Ministry of Transport, also spoke at the luncheon. He said that "noise, air pollution and general cleanliness are pressing problems in urban areas. Electric propulsion for road vehicles, if it is achievable, offers a major step forward in improving urban environment."

Mr. Williams continued: "It is of course, technically possible to reduce noise and pollution from internal combustion engines. But, nationally, the economies of reducing the volume of imported fuels may become important. For these reasons, the Ministry of Transport is very interested, as part of its general research and development programme in co-operation with the Ministry of Technology, in the further development of road vehicles with electric traction. The important thing is that the availability of adequate electric power would allow complete reconsideration of the design of the vehicles themselves. It is not a question of driving existing vehicles by electric traction, but of taking advantage of the flexibility of electric traction to consider the whole design as a new system.

"Let us face the fact that for wide acceptance, as opposed to specialised application, the key question is range, which depends on the energy source or reservoir. As you know, much is going on in research in new kinds of cells and batteries. It does not matter to the vehicle designer where his power comes from, but practical considerations of safety, toxicity, refuelling or recharging may decide the issue for particular applications. Motor and equipment designs may need to be reconsidered to see whether low voltage high current supply can be used to ease the design and refuelling process of the energy source, considering the system as a whole. Electric vehicles seem inherently simple, cheap to maintain and of long life.

"Four classes of vehicle may emerge each with different requirements and problems: the public service passenger vehicle; the road haulage vehicle; the commercial multiple delivery or factory vehicle; and the private car."

### "Thermal Environment"

The Institution of Heating and Ventilating Engineers announces that a symposium under the title "Thermal Environment in Modern Buildings—Aspects affecting the design team", is being arranged, in collaboration with the Building Research Station, to be held in London on 29 February, 1968. The meeting will be in the Purcell Room, South Bank, S.E.1.

The synopsis with the announcement says that increasingly in recent years the designers of engineering services have found it more difficult to reconcile their objectives concerning artificial lighting, acoustics, ventilation and temperature control with the architecture of modern buildings. Perhaps most fundamental in this issue has been the emphasis given to day-lighting considerations and the increasing use of lightweight claddings at the expense of the thermal environment.

At this symposium a group of distinguished authors actively concerned with these problems examines the constructional, functional and stylistic considerations which affect façade design, and analyse the building as a whole in relation to human requirements. Basic environmental comfort factors are reviewed.

Until now there has been a dearth of data on how to calculate temperatures in buildings warmed by sunshine but not air-conditioned. Recent research has developed a method for doing this and the theoretical results are compared with surveys of experience in existing buildings, as the result of this work simple design rules have been developed.

How design changes in window size and orientation, ventilation and sun controls can affect the cooling load on a building are examined; also the effect of structural mass in achieving a satisfactory thermal solution. For air-conditioned buildings data are put forward on how the allowing of temperature swings can effect economies. The results of recorded energy consumption in air-conditioned buildings are presented and discussed.

Full information may be obtained from IHVE at 49 Cadogan Square, London, S.W.1.

# INDUSTRIAL CHIMNEYS FOR OIL-FIRED PLANT

*An address given by G. Knox, A.M.Inst.F., A.M.I.H.V.E.,*
*Senior Fuels Development Engineer, Shell and B.P. Scotland Ltd.,*
*at the Conference of the Scottish Division in Ayr on 19 May, 1967*

A GREAT deal has already been said on the subject of chimneys related to the Clean Air Act and its associated Memorandum on Chimney Heights, and I do not intend to deal with this aspect today, neither shall I go into full details of chimney design. I intend rather to discuss the problems one may meet with flue systems and chimneys of oil-fired plant and to suggest means of overcoming these problems. The chimney has long been looked upon as a necessary evil and as a very simple piece of equipment: as a result of these attitudes, there is no doubt that in many cases chimney design has not in fact been given sufficient consideration. The basic functions of a chimney are:

*a.* to disperse the effluent gases in such a manner as to render them innocuous to human and plant life at ground level or in adjacent premises;

*b.* to create within itself a negative pressure sufficient to overcome the frictional resistance of the plant which it serves;

*c.* having met the requirements of *a* and *b* the chimney design must be such that excessive temperature drop or temperature inversion will not occur under all load conditions.

To achieve these functions the design of the chimney and flue system must meet certain requirements and I shall now deal with these and their associated problems.

## Chimney Height

In most cases the chimney height is decided under the provisions of Section 10 of the Clean Air Act 1956 and is related to the estimated maximum emission of sulphur dioxide. The plume rise from the chimney exit gives in effect an addition to the physical height and I would therefore suggest to you that it is rather nonsensical to destroy this plume by the use of a cowl as we see fitted to so many chimneys. The reasons normally given for fitting such cowls are not in fact very sound—this plain "Chinaman's Hat" cowl will not avoid downdraught and its value in the prevention of moisture ingress is extremely doubtful when one considers that 1 in. rainfall is equivalent to 16 lb. moisture in a 2 ft. chimney whilst the combustion of 2 gallons of oil fuel produces approximately 15 lb. of moisture.

## Cross Sectional Area

To ensure the adequate dispersal of gases, it is essential that a suitable gas exit velocity is maintained, this being a function of the volume of gas emitted and the cross sectional area of the chimney exit. Suggested minimum velocities are 20 ft. per second for plant operating in natural draught and 25 ft. per second for plant equipped with FD or ID fans. If these minimum velocities are not attained we may well be faced with the problem of downwash and/or inversion. (See Fig. 1.)

Waste gases emitted at low velocity will probably result in downwash on the lee side thus reducing the effective chimney height by destroying the plume rise. This condition will also lead to unsightly staining of the chimney walls.

Low gas exit velocity will also allow the ingress of cold air which will flow downwards within the chimney, being heated by the outgoing waste gases and by the chimney walls. This inversion

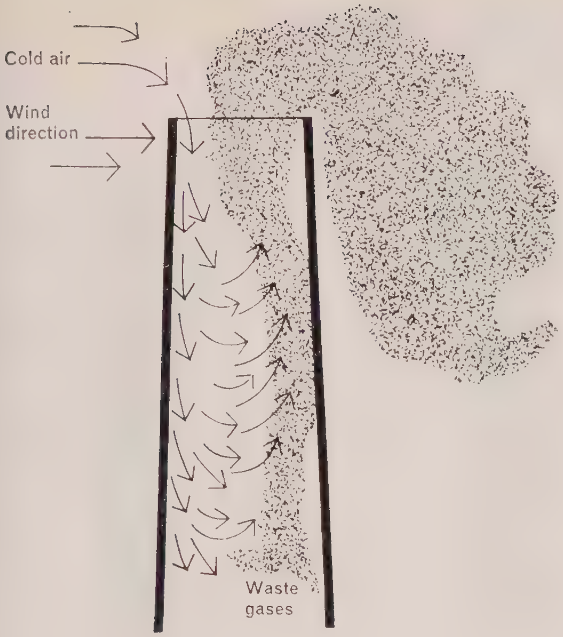


*Fig. 1. Diagrammatic illustration of downwash and inversion*

effect causes a cooling of the internal chimney surfaces and of the rising gases as a result of which the production of acidic smuts will be almost inevitable.

At this stage I would touch briefly on the question of low temperature corrosion and the production of these acidic smuts.

If a sulphur-free fuel is burned using approximately 30 per cent excess air, moisture will begin to condense out of the flue gases when the temperature drops to approximately 113°F., this temperature being referred to as the water dew point. (See Fig. 2.) The products of combustion from any fuel which contains sulphur will have, in addition to this water dew point, an acid dew point at which sulphuric acid will begin to condense out. It is extremely rare to encounter water dew point in an industrial plant flue system but with today's highly efficient oil-fired plant it is not uncommon to approach acid dew points. The actual acid dew point temperature will vary dependent upon several factors, among which are—the sulphur content of the fuel and the excess air present, but is generally in the range of 240°F. to 280°F. The combustion of any fuel will produce stack solids which consist of particles of ash and/or partially burned fuel which are suspended in the gas stream and which will normally be discharged to atmosphere. If in any part of the flue system the gas side surface temperature is at or below the acid dew point, an acid film will form on the surface. This film acts as a "fly paper" collecting the small particles of stack solids which then build up in layers which eventually become dislodged and are discharged to atmosphere as acidic smuts which can create a nuisance by staining and acidic attack.

The achievement of the desired minimum velocity is comparatively simple in the case of a new chimney, being merely a design function. It is important, however, to check the velocity attainable at minimum load conditions, e.g., if a burner plant is producing 100 cu. ft. of waste gases per second at full load, a chimney having a cross sectional area of 5 sq. ft. will give a gas velocity of 20 ft. per second. The same burner when turned down may be producing only, say, 30 cu. ft. of waste gases per second in which case with a chimney cross sectional area of 5 sq. ft., the velocity is now reduced to a mere 6 ft. per second. This type of situation is often met in the case of a multi-boiler installation where the turn down could

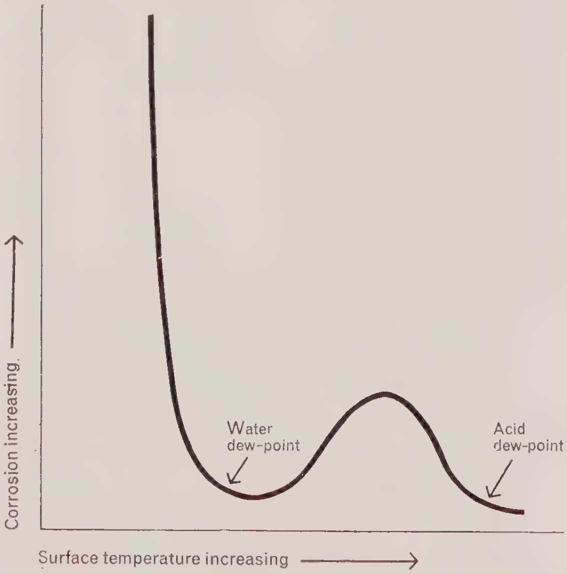


*Fig. 2. The relation between surface temperature and corrosion of steel for flue gases containing $SO_2$, $SO_3$ and $H_2O$*

be 20 : 1 due to, for example, a large winter space heating load with only a very small summer load requirement. Under such conditions it would be well nigh impossible to attain the desired exit velocities and a separate chimney would be taken from each boiler. In such cases it is now reasonably common practice to group these individual flues into one chimney stack. In the event of trouble being experienced due to low exit velocities, a possible solution is the fitting of a venturi cap in the form of a truncated cone.

While the cone should be designed to give the maximum possible efflux velocity, care must be taken to ensure that the pressure drop across the cone will not be too great for the available draught. To minimize this pressure drop, it is recommended that the maximum included angle of the cone be 30°. (See Fig. 3.)

## Heat Loss in the Flue and Chimney System

It is essential to ensure that, as far as is practicable under all load conditions, no gas side surfaces in the system drop in temperature to the acid dew point or below, otherwise low temperature corrosion and the possible formation of acidic smuts will inevitably occur.

Heat losses must therefore be calculated for all load conditions to determine the required insulation values for the materials used in construction.

Probably the most commonly used material for chimneys for new plant is mild steel: a material which has a very high heat transfer rate. Excessive heat loss from such chimneys can be reduced by the use of some form of external or internal insulation. The majority of steel chimneys are prefabricated in flanged sections and it is essential that any form of insulation covers these flanged joints where otherwise a substantial heat loss will occur.

A form of insulation for steel chimneys using aluminium cladding was developed in 1958 by the British Petroleum Co. Ltd. in conjunction with the British Launderers Research Association. (See Fig. 4.)

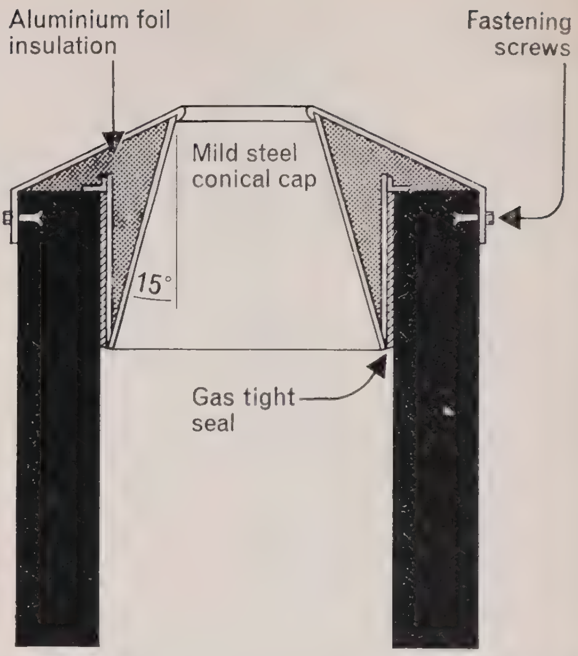


*Fig. 3. Typical insulated mild steel cap fitted to the terminal of an existing brick chimney*

The outside of the conventional steel chimney is encased in 16 gauge polished aluminium sheet which is held at a distance of $\frac{1}{4}$ in. from the chimney wall by the use of asbestos spacers. This $\frac{1}{4}$ in. airspace assisted by the reflectivity of the aluminium sheet provides the insulation, and it is essential to ensure that the airspace is sealed at the chimney top and at all flanges to prevent the ingress of moisture.

Modifications to this basic idea are now available which consist of two concentric steel shells with an airspace which is packed with layers of aluminium foil or with an insulating material such as mineral wool or a granular type insulation.

British Petroleum have also carried out experiments on the use of mineral wool insulation applied directly to the outer surfaces of a steel chimney and covered with aluminium sheeting. This method has resulted in a significant reduction in the heat losses from the chimney.

It will be appreciated that some form of insulation is generally essential if the gas side surfaces of the chimney are to be maintained above the acid dew point of the gases. Chim-

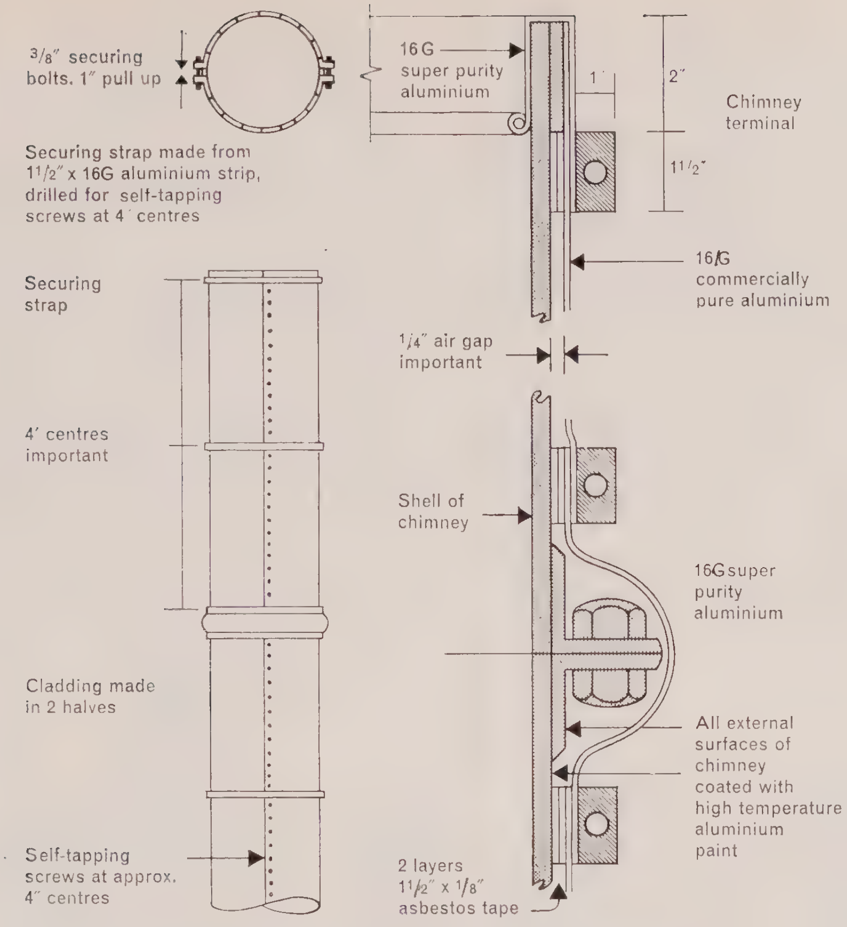

3/8" securing bolts. 1" pull up
Securing strap made from 1½" x 16G aluminium strip, drilled for self-tapping screws at 4' centres
16G super purity aluminium
1"
2"
Chimney terminal
1½"
16/G commercially pure aluminium
Securing strap
¼" air gap important
4' centres important
Shell of chimney
16G super purity aluminium
Cladding made in 2 halves
All external surfaces of chimney coated with high temperature aluminium paint
Self-tapping screws at approx. 4" centres
2 layers 1½" x 1/8" asbestos tape

*Fig. 4. Aluminium cladding of a steel chimney*

neys constructed of brick or concrete should, wherever possible, be internally lined. This lining can take the form of a "gunned" insulating refractory or of acid resisting brick. In all cases the advice of a specialist contractor should be sought as to the most suitable lining. All brick chimneys, even if unlined, should be constructed with the use of an acid resisting mortar, particularly in the top section. Chimneys manufactured from plastic materials are also available and while they are impervious to low temperature corrosion, they may still require some form of insulation to obviate smut emission. Plastic chimneys must not be used where gas temperatures are extremely high: the limiting temperature is normally of the order of 600°F. but this should in all cases be checked with the manufacturers.

Apart from the insulation of the chimney, attention must be given to the flue system to ensure that there are no points of excessive heat loss or of cold air ingress. In the case of multi-plant installations, special attention must be paid to the effective sealing of all intake branches: many cases have occurred where the cause of smutting was the ingress of cold air through a boiler which was off load.

### Draught

Very few modern industrial oil-fired plants rely on natural draught: the majority using forced or induced draught fans. In some cases the chimney height required to satisfy the Clean Air Act will create a greater draught than that required for the efficient operation of the combustion equipment and some form of draught control may be required. It is essential to ensure that such a control system does not admit large volumes of cold air into the system.

In all flues and chimney systems a resistance to flow is set up due to no points of excessive heat loss or of design stages to ensure that the available draught is capable of overcoming the total friction set up in the system. To this end, all bends or changes of shape or direction in the flue system should be as gradual as possible and flues should have a continuous rise to the point of entry into the chimney. The actual flue entry to the chimney should, wherever possible, be at minimum angle of 135° and the chimney should be filled in below the flue entry unless an inspection or cleaning door is essential at low level, in which case the necessary well should be as small as possible.

**Siting of Chimney**

Having spent time and effort on the design of a first-class chimney, it is essential that this effort is not wasted by siting the chimney in such a position where it may be affected by down-draught and eddies from any adjoining buildings, etc.

Having covered briefly the main points in chimney and flue systems where problems can arise, I would stress that in any plant, maintenance must be carried out on the flue system in addition to the combustion equipment. The performance of a basically good system can be ruined by lack of attention, particularly with regard to the sealing of such items as cleaning doors, explosion doors and dampers.

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## *ECONOMIC COSTS*

**Economic Costs of Air Pollution: Studies in Measurement. Ronald G. Ridker. Praeger Special Studies in U.S. Economic and Social Development, pp. 125. Frederick A. Praeger, New York, Washington and London.**

This is a technical study of air pollution costs by an economist for economists. The principal point made is that air pollution is a social cost—or in economists' phraseology an "external diseconomy". That is, air pollution is an unwanted side-effect of economic activities, and there are no market forces that compel the user to consider the costs he imposes on others. "Without regulation, therefore, the air is used as if no such costs were present and air pollution rises to a level that is socially undesirable."

The author seeks to relate such costs with the cost of control measures, and shows the relationship in curves depicting the two costs. Three different "strategies" for measuring the cost of pollution are described, and these are later exposed, stressing the theoretical and practical difficulties as brought out in field studies.

In the main the conclusions reached are negative and point to the need of much more work before cost-of-pollution curves can be established. Until such time as such curves, and cost-of-control curves, can be determined, attempts to fix air quality standards must be based on guesswork. Or perhaps on non-economic criteria.

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**"Managing Energy"**

A conference with this title is being organized by the Combustion Engineering Association and will be held at the Hotel Metropole, Brighton, on Thursday and Friday, 9 and 10 November.

The conference will be forward looking and has been planned to examine the main factors influencing the efficiency of energy production and usage in industry, and the degree of responsibility which may rest with top level management in this field.

Further information is available from the Association, at Trident House, Station Road, Hayes, Middlesex.

**Institutions May Merge**

Discussions are taking place between the Institution of Mechanical Engineers and the Institution of Heating and Ventilating Engineer on the possibility of a merger. The Councils of the two institutions expect to make a further announcement in the near future.

five recommended solid smokeless fuels for domestic solid fuel appliances

consult your Gas Board regarding availability of these recommended fuels

# Contributions to Cleaner Air

## Industrial and Commercial News

### ELECTRICITY RESEARCH

The Electricity Council have published a valuable review, handsomely produced and illustrated, of research programmes in train in the electrical field—covering nuclear generation, conventional fuels and steam raising, electrical generation, environmental problems, projects, transmission and distribution, utilization, load research, and market research. Over the period from 1956-7 to 1966-67 total annual expenditure on research (capital and revenue) rose from just under £900,000 to nearly £11 m.

A short section of the review, dealing with one aspect of air pollution control, may be quoted in full:

When the site of a new generating station is chosen, one of the first problems is where the chimney stacks can be positioned to ensure satisfactory dispersal of the plume.

The new low-speed wind tunnel at Marchwood has been designed to simulate accurately the plume behaviour in any locality and at any wind velocity and direction. A scale model of the stack and associated power station buildings is constructed into a correctly-contoured "map" of the surroundings. If the model is built to a scale of the order of 1 : 1,500, a representation of some five miles of countryside can be achieved.

Windspeeds are variable from 1 or 2 to 200 feet per second, and by revolving model the plume-effect of any wind can be studied.

The value of this method is that even the most difficult topographical situation can be imitated. A model on test recently was of a coastal area, with rising cliffs and downs producing unusual wind conditions inland of the proposed station.

Methods of studying the plume vary from the visual, in which coloured smoke is used, to the analysis of gas samples collected from positions at or near the surface of the contoured "countryside". Density and buoyancy of the smoke is varied by dilution with other gas.

The design of a research tool of this kind is much more complicated than would appear at first sight. The boundary-layer effects of the surfaces of the tunnel must be closely studied to find what changes they introduce into the air flow. Thermal factors must also be taken into account. The result at Marchwood is a tunnel 77 feet long, 30 feet wide and 9 feet high, giving an effective working section of 27 by 7 feet. As the tunnel is an "open circuit" special entry and exit screens were designed to eliminate the variations which could be introduced by external atmospheric winds. The tunnel will also be used for determining wind-loading on cooling towers, power station buildings and transmission lines.

### FLOATING SMOKELESS ZONES

For 67 years the *Sir Walter Scott*, a pleasure boat operated by Glasgow Corporation, has steamed up and down Loch Katrine in the Trossachs. Her two hand-fired boilers were installed in 1956, and the only marring thing on the trips was the smoke from the funnel. Now she is running on Rexcobrite smokeless fuel. The comment of the skipper, Capt. David Stewart, was "As far as we are concerned on deck this smokeless fuel is great stuff. Until now every day was washday on deck because of the soot which was inevitable with ordinary coal. Everything is much cleaner now."

And in the engine room, Mr. James McFarlane, engineer on board for 24 years, commented: "It is the finest thing that ever arrived on this ship and

I've been wandering around her since I was a young chap.

"With this Rexcobrite there are no dirty tubes, no soot, no smoke, no dust, and hardly any ash. It also gives a good head of steam."

The two manually-stoked boilers built by Marshall & Anderson Ltd., of Motherwell, were installed in 1956.

Mr. James Henderson, mechanical engineer in the Corporation's water department, which is responsible for the operation of the *Sir Walter Scott*, explained that it was decided to change to smokeless fuel primarily for the amenity of the passengers and because of Glasgow's overall smoke abatement policy.

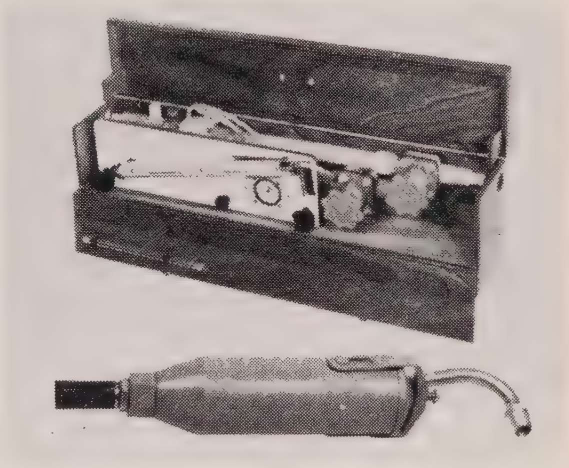
"Cleanliness on board has been considerably improved since changing over to Rexcobrite," he said. "Previously when it rained, wet soot came down on the passengers. The canvas awnings to protect the passengers in extremely hot or inclement weather in the past had to be renewed on average every three years because of their condition through smoke and soot. Now they are remaining clean."

## G.W.B. BOILERS LTD.

G.W.B. Boilers Ltd., of Dudley, have recently completed a survey on the performance of their "Powermaster" Oil/Gas Fired boilers installed throughout Britain over ten years ago. These were the first packaged boilers available in the country.

Questionnaires were despatched to the first customers, and although a number of boilers had been re-sold, 90 valid replies were returned completed. These showed that the efficiency of a ten year old or more "Powermaster" remains in excess of 80 per cent—in most cases users claimed 83 per cent plus, which is the guaranteed figure for new boilers. A brochure records each customer's actual data, separately.

The same firm has also issued information on what is claimed to be a revolutionary pneumatic handling system for the hitherto difficult problem of wood waste burning. The unit, which has taken some five years to develop, requires to operate with a small amount of coal, say 20 per cent, the remaining output being provided by wood waste. Both chippings and sawdust can be used. More information can be obtained from the company, P.O. Box No. 4, Dudley, Worcs.



## NEW FLUE GAS DUST SAMPLING SET

Of special interest in view of the newly issued report on grit and dust emissions, and the forthcoming regulations, is a new flue gas dust sampling set, which we illustrate, introduced by Airflow Developments Ltd. (Lancaster Road, High Wycombe, Bucks).

Designated as the Mark IIIA, it operates on the following principle: the sample of the flue gas is drawn through a sharp edged nozzle of predetermined size into a filter bag or thimble and then through a catchpot cooler and orifice plate flow meter by means of an electrically driven exhauster. The filter bag is weighed before and after use.

It has been developed from the Central Electricity Generating Board's Mark II set (British Standard 3405/1961), and incorporates some modifications typical of Airflow Developments Ltd., which make it compact, portable and easy to handle. It is complementary to the BCURA (cyclone-filter) set manufactured by the same company.

## REGISTER OF DOMESTIC HEATING ENGINEERS

In our last issue (page 269) we gave an account of the new registration scheme for domestic heating engineers, with a two-year guarantee, launched by the Heating Centre. The Centre now reports that they are very pleased with the reception given to the scheme by the trade press and consumer authorities. The Register was 150 strong by early July, with many applications in the pipeline. Well over 2,000 references had then been taken up in the examination of the applicants, who are centred in 119 different towns throughout the U.K. It is anticipated that by the end of the first year of operation some 25 per cent of the estimated 2,000 competent heating engineers throughout the country will have been registered.

## "FLEXEL" SHEET HEATING

An interesting and novel system of particular use in ceiling heating systems is by "Flexel", a new electrically conducting sheet material developed by ICI. This new material heats by area, and gives even heat transmission over its whole surface with no hot spots or lines of high temperature such as are found with hot wire systems. It is said that extensive research has shown that this method of heating gives maximum personal comfort with low running costs.

The Flexel sheet material is made by coating a conducting silicone elastomer on to glasscloth, and is supplied by ICI made up into electrical heating elements designed for installation immediately above the ceiling face. Each element consists of a length of Flexel conducting sheet fitted with copper strip electrodes along each side of the length of the sheet, and enclosed in an insulating sheath of "Melinex" film. For ease of assembly a tail of PVC insulated flexible wire is fixed to one end of each electrode.

The elements are available in any suitable width from 6 to 54 inches, and in any length.

The Flexel sheeting is used in "Thermosonic" heated ceilings, being manufactured by William Beardmore & Co. Ltd.

## RADIATION NEWS

Radiation Gas Fires Ltd. announce the introduction of a new version of the well known glass-fronted Crystalglow, a model for larger rooms, with a nominal rated input of 30,000 Btu/h and an output of 21,000 Btu/h. It is suitable for public rooms, restaurants, etc. To cater for such rooms, where it is not always possible for everyone to sit near the hearth, the emphasis is placed on convected rather than radiant heat, with approximately 72 per cent convected and 28 per cent radiant. The Crystalglow Major is fitted with an 8 position thermostat and of course has automatic ignition, which is from a pilot flame with a special flame failure safety device.

Radiation Central Heating Ltd. announce the introduction of a larger capacity version of their Heatmaster gas-fired small-bore central heating unit. Rated at 60,000 Btu/h, the Heatmaster 6600 is suitable for the bigger semi-detached or detached houses.

The Heatmaster is still the only boiler on the domestic heating market to incorporate a modulating control. This adjustable control allows the unit to turn itself up or down automatically in accordance with the temperature requirements of both the radiators and the hot water system by measuring how much unused heat is returned to the boiler.

## GAS NEWS

### *Queen's Award for Gas Process*

The Queen's Award to Industry, 1967, has been made to the Gas Council for the Catalytic Rich Gas Process. The application for the award was made on the basis of two achievements by the process: first, a number of plants to the Gas Council's design have been exported; and second, the process represents an important technological advance in the techniques of gas making.

Research at the Gas Council's Midlands Research Station at Solihull on the laboratory scale, and a team of scientists and engineers, under Dr. F. J. Dent, F.R.S., then Director of the Station, developed the process to the large pilot scale. The first full scale plant was built at the Bromley-by-Bow works of the North Thames Gas Board, and went into operation in August 1964.

Basically, the process consists of reacting light distillate, previously freed from sulphur, with steam in the presence of a catalyst at a pressure of the order of 25 to 30 atmospheres. The crux of the invention was the discovery that with a low steam to distillate ration and a low reaction temperature—500° to 550°C.—the whole of the distillate could be converted to a methane-rich gas without deposition of carbon occuring. This basic process produces a gas of calorific value up to 800 Btu/c.ft. but by introducing a second stage in various ways, a whole range of gases can be produced from the one basic plant, from "lean" gas of 350 Btu/c.ft., through normal town gas of 350 Btu./c.ft., right up to a substitute natural gas of calorific value close to 1,000 Btu/c.ft. The catalyst used is a nickel-alumina catalyst specially designed to enable the reactions to take place at relatively low temperatures.

Among the many other advantages of the process, it is pointed out in a brochure issued by the Gas Council that substitute natural gas made by the process could have great importance as a source of peak load gas when the country as a whole is receiving natural gas from the North Sea.

### *Process for Japan*

A process developed by the Gas Council at its Midlands Research Station is to be used by the Osaka Gas Company of Japan for the erection of a semi-commercial plant. The process is one for the production of gas from crude oil by hydrogenation. The company proposes the erection of a fully commercial plant at a later stage.

In this process gasification is obtained by the hydrogenation of crude oil in a reactor with a fluidized bed, operating at high temperature and pressure. There is no catalyst and a rich gas can be continuously produced.

### "*Preparing for Natural Gas*"

This is the title of an illustrated booklet described as "a progress report to industry", being issued by the Gas Council to industrialists all over the country. Its purpose is to show how natural gas can benefit industry. It details the differing properties of town gas and natural gas, and the changes these differences necessitate in town gas burners and controls. How conversion to natural gas of industrial premises is carried out is described and the importance of doing as much pre-conversion work as possible on existing equipment is stressed.

### "*Gas Goes Natural*"

This is another booklet from the Gas Council, in which are outlined the plans for the development of the industry over the next few years. Much financial and other information is given, and the case is presented for increasing the industry's borrowing powers to cover the £1,450m. on capital development that it is estimated will be required during the next five years—mainly to exploit the finds of natural gas made beneath the North Sea.

### *Gas Council Seal of Approval for Catering Appliances*

The Gas Council Deputy Chairman, Mr. Arthur Hetherington announced on 17 July, 1967, that the Council's Seal of Approval was to be awarded to approved catering appliances. In future the Seal will be granted to all catering appliances which have been approved by the Council's Watson House Approval Division to the relevant British Standard (B.S.2512).

*The Gas Council Approval Seal*

The Seal will indicate to prospective buyers that the equipment has been tested for safety, performance and durability.

With the advent of natural gas, the testing procedures now incorporate examination under these three headings of the appliance's suitability for operation on natural gas. Conversion sets, to make town gas appliances suitable for natural gas operation are also examined.

Only approved appliances will be allowed to carry the Seal and be entered on the Council's list of approved and tested gas catering appliances which is published yearly.

# News from the Divisions

## North West

Members of the Division visited Wylfa Nuclear Power Station, Anglesey, North Wales on Wednesday, 23 June, 1967. On arrival at 11.00 a.m. members were entertained to coffee and then shown models, drawings and photographs of the Station. An inspection of the plant followed which occupied the remainder of the morning and continued throughout the afternoon. Members were entertained to lunch and tea by the Regional Officers of the North Western Electricity Board. Those who availed themselves of the opportunity to go inside the Reactor changed into "clean conditions" clothing before doing so.

## Yorkshire

A meeting of the Divisional Council was held at the Grand Hotel, Sheffield on Monday, 5 June, when members were entertained at lunch by the East Midlands Gas Board. Mr. E. K. Eastabrook, Divisional Sales Manager of the Board later spoke to the meeting on the contribution of the Gas Industry to smoke control areas. His talk was illustrated by slides showing various appliances, home heating methods and the role of natural gas in clean air progress.

A short meeting of the Divisional Council took place prior to Mr. Eastabrook's talk.

On Monday, 3 July, the Divisional Council travelled outside their borders to Sunderland, meeting at the Rosedene Hotel where Councillor Mrs. M. Miller, Chairman of the Sunderland County Borough Housing Committee entertained members to coffee. A visit to Gilley Law followed for a tour of low rise and high rise flats group heated by solid fuel. The boiler house attracted special interest. Afterwards members were entertained for luncheon at the Roker Hotel by kind invitation of the National Coal Board.

## South East

The Council of the Division met at the Royal Society of Health, London, S.W.1 on 13 July. During a full business session subjects covered included arrangements for a general meeting to be held during the winter 1967-68 and a consideration of the many matters raised in the Hon. Secretary's report which referred to steady progress throughout the South East in establishing smoke control areas being maintained, this despite Circular 42/66 on Public Expenditure which might have been expected to cause the faint hearted to waver. Only three authorities in the Division modified or delayed their smoke control programme as a result of the Circular.

# Air Pollution Abstracts

**1002. Selection and training of judges for sensory evaluation of the intensity and character of diesel exhaust odours.** Turk, Amos. (PHS Publ. No. 999-AP-32. 1967, 45 pp.) Exhaust gases emitted by diesel engines are characterized by offensive odours. These odours must be rated numerically by human judges with the ultimate objectives of (1) correlating such ratings with the chemical composition of diesel exhaust and (2) establishing Federal standards for control of diesel exhaust odours. Judges are selected on the basis of (1) their ability to distinguish among odours of different intensities and qualities, and (2) their behaviour in subjective testing environments. The chosen judges are then trained to improve their performance in odour discrimination, to become familiar with diesel exhaust odour, and to rate the odour in terms of intensity and quality standards that are provided to them for reference. These standards comprise a scale of overall odour intensity, and four odour quality scales that correspond to the descriptions "burnt/smoky", "oily", "pungent/acid", and "aldehydic/aromatic". Appendices describe (A) the theoretical basis for air purification requirements in test chambers for odour studies, (B) the composition and make-up of the diesel odour standards, and (C) the mathematical derivations of the statistical procedures.

**1003. The Use of Ammonia to eliminate Acid Smuts from Oil-Fired Plant.** Etoc, P. (J. Inst. Fuel. June 1967, **40,** No. 317, 249-251). Large central heating installations and industrial boilers burning heavy fuel oil may suffer from acid smut formation. The report shows that by the injection of ammonia it is possible to suppress the emission of this type of pollutant.

**1004. Desulphurization of Flue Gases by means of adsorption cokes of varying properties.** (In German). Dratwa H. and Juntgen, H. ("Staub", July, 1967, **27,** No. 7, 301-307). In the case of desulphurization of flue gas by means of adsorption coke the properties of the products used are of decisive importance. Coke from peat and from air-oxidized hard coal, and charcoal differ considerably as regards their kinetic behaviour during the binding of $SO_2$. The formation of surface oxides, which is a secondary reaction, also develops for these products at different velocities. The strength of adsorption coke, which is of particular importance and is a junction of chemical combustion occurring in this process, depends on the original material and also on production conditions of coke. Products formed by means of an extrusion press have a basically higher strength than granular materials. The flow resistance of coke, which depends on the size and form of particles, is particularly low in the case of spherical pellets.

**1005. Campaign against Atmospheric Pollution from Domestic Sources.** (In French) Fournier, M. and Jacquinot, P. (Pollution Atmospherique, April-June 1967, No. 34, 91-99). Following five direct action campaigns against domestic pollution, the technical services of the Housing Department of the Prefecture de la Seine are now carrying out the verifications stipulated in the regulations, particularly in the specially protected areas. Although they have means of coercion at their disposal, the technical services continue to act as much as possible by informing and persuading the people concerned. The document published gives an account of the operations; the statistics therein are analyzed and, whenever possible, set out in graphs.

**1006. Continuous Measurement of the Dust Content of Combustion Gases of Pulverized Coal Downflow of "E.D.F." Extractors.** Debrun, G. (Pollution Atmospherique, April-June 1967, No. 34, 84-91). 1. Reasons for which it appeared appeared necessary permanently to control the efficient functioning dust extractors of the existing or future 250 and 600 MW range, using appliances to measure continuously the dust content of combustion gases downflow of extractors. 2. Description of the test station set up at Champagne-sur-Oise with the object of trying out various types of appliances suitable for making such measurements. Brief description of the type and system introduced and all have been applied to the determination of benzo(a)pyrene in airborne particulates. Factors compared are precision, accuracy, man hours of work and total analysis time. Specific recommendations given for methods by means of which a high order of selectivity, maximum information, considerably reduced analysis time, or a low cost of analytical operation are possible. Use of relatively low cost fluorimetric procedure is achieved with the loss of simultaneous characterization.

**1019. Extent and Evolution of Home Heating by means of Liquid Fuels.** (In Italian) Somazzi, S. (Fumi Polveri, June 1966, **6,** (6) 163-6). Consumption of fuel oils for heating purposes is, in Italy confined mainly to the north. A study conducted in Paris in 1960 shows that 53 per cent of the air pollutants in that city originate in domestic heating units and that 75 per cent of them are improperly serviced. Current heating systems employing coke, anthracite, kerosene, or gas oil, automatically stoked and operated, are 80 to 90 per cent efficient in keeping down air pollution. Various modern heating units for individual home heating or for heating blocks of homes and heat convention via radiant panels instead of radiators, are currently being studied and used. Automation of heating units provides the double advantage of savings in operating labour and of controlling combustion more effectively than can be done manually.

## B.C.U.R.A. REPORT

The 1966 Annual Report of the British Coal Utilisation Research Association shows that the income has remained the same as in 1965, just over £730,000. In many instances the work of previous years has been completed or virtually completed, and in general the year has been one of consolidation. In the course of this, however, many gaps in knowledge of basic design data have been disclosed and desirable future programmes of work have accordingly suggested themselves.

The Report, priced at 2 gns., may be obtained from the Director of Intelligence and Publications, The British Coal Utilisation Research Association, Randalls Road, Leatherhead, Surrey.

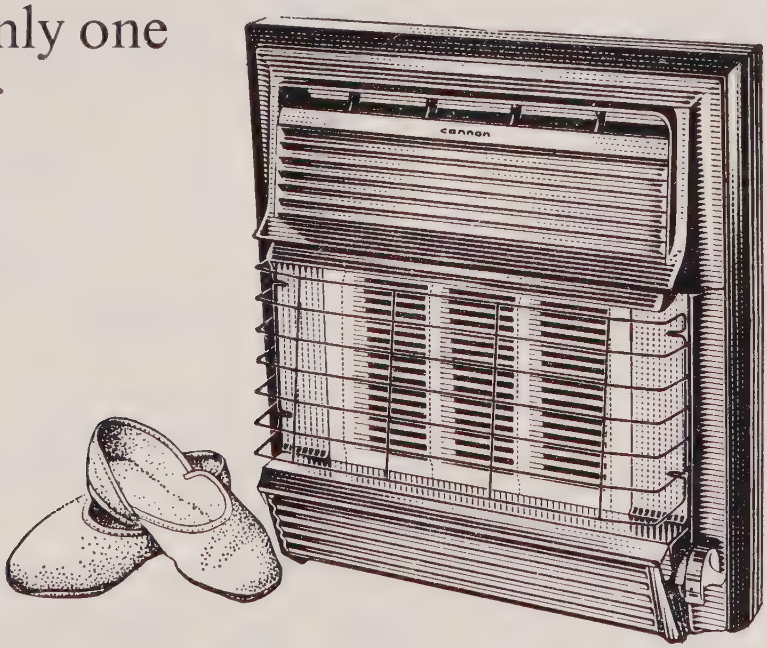
Shell boiler trials have shown that the vibrating grate is better suited to washed smalls than singles. Attempts are being made to overcome difficulties with clinker formation and unsteady feed that were experienced with some coals, and changes in the installation have shown promise of doing so. A decision on the value of the vibrating-grate principle for shell boilers is expected during 1967. Further work on recirculation of flue gases through a deep fixed fuel bed has shown that this eliminates serious clinker formation. Considerable success has been achieved in eliminating the build-up of deposits on the end plates of Economic boilers when burning high-chlorine coals, by installing a steam jet or a compressed-air jet behind the bridge wall. Trials on users' plant have confirmed the effectiveness of the steam jet.

Alternative versions of the B.C.U.R.A. heat meter have been developed and it is expected that a final design will be decided upon in the middle of 1967. In further tests with the experimental trickle-feed coal-fired household boiler, attention has been directed especially to coal feed, mechanical de-ashing, use of overfire air, and control systems. Singles have been fed successfully provided that the B.S. swelling number of the coal was not greater than 1½. Modifications are being made to the design of the B.C.U.R.A. electrical precipitator for smoke measurement, to overcome difficulties arising from the different nature of smoke from coal-fired boilers as compared with that from open fires. A continuous flue-gas analyser has also been successfully developed for domestic boilers. Testing of fuels and appliances under contract with the Ministry of Technology has continued.

Definite conclusions about the role of nitric oxide in the oxidation of sulphur dioxide in flue gases have been established.

# Gas miser!

The biggest radiant heat
The hottest convected heat
To heat small rooms faster
To heat bigger rooms
Yet so efficient and so well designed
that it always costs less to run
There's only one
GasMiser



**Cannon GasMiser**
(Regd. Trade Mark)

Cannon Industries Limited · Deepfields · Bilston · Staffs.

MONEY-SAVING PROPOSITION FOR SMOKELESS ZONES

THIS FIRE...

is the heart-warming answer to the cold facts of the Clean Air Act. Now, no one has to give up a real living fire even in a smokeless zone. The FANTOM has been designed in conjunction with the National Coal Board.

...SAVES THIS MONEY: £5

AT LEAST ON EVERY APPLIANCE

ON EVERY HOUSE...

With an average installed cost of £15.10.0, the FANTOM is cheaper than any other domestic appliance designed and guaranteed to burn smokeless fuels.

IT LIGHTS QUICKLY

(gas ignition optional), recovers quickly and burns to a fine ash the full range of smokeless fuels, such as Sunbrite, Coalite, Gloco and Rexco.

CENTRAL HEATING TOO

The FANTOM provides 5 hot-water radiators and hot water for new or existing houses to the full Parker Morris standard more cheaply than any other system. Running costs: nil—as long as the fire's alight!

IT IS FIXED WITH...

Yes, with just two screws, it fits any standard 16" fireplace with or without a back boiler in one-eighth the time it takes to fit any comparable smokeless fuel burning appliance.

THE SECRET...

The FANTOM uses a built-in electric fan to stream air up through the fuel, noiselessly, continuously, controllably. Switch on, and all smokeless fuels burn brightly: to give a glowing, *living* fire.

FANTOM

the power behind the living fire

*Enquiries please, to:*

Richard Baxendale & Sons Ltd., Bamber Bridge, Preston, Lancs

**Of all the forms of smokeless heating, one gives you efficiency, economy and real, cosy, friendliness**

**YOU'RE LOOKING AT IT NOW.**

**Welcome home to the living fire**

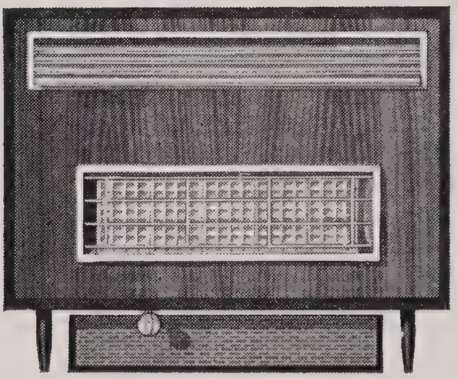
You get the friendly, cheerful glow that *only* a living fire can give—but no smoke! You also get a lot more. A modern open fire or room heater, burning solid smokeless fuel, will circulate warmth all around the room. Without leaving any chilly corners. This FANTOM open fire has a built in electric fan for forced draught. With high output back boiler it provides domestic hot water and runs five radiators.

Room heaters have the fire enclosed behind glass, they burn slowly, economically and efficiently. With a high output back boiler, they heat radiators round the house for room-to-room warmth and provide constant domestic hot water.

**JUST RIGHT FOR SMOKE CONTROL AREAS**

Issued by the National Coal Board

Will that beautiful gas fire leave the water cold...



or will it hide a hot water secret?

Going smokeless ... then heat that water with a Maxol Back Boiler Unit. A Maxol Unit behind a gas fire provides household hot water when its wanted ... fast!
The Maxol runs on High Speed Gas and makes use of existing plumbing to provide lashings of hot water. Whether the fire is on or off the Maxol provides a controlled supply ... from a sinkful to a bathful.
**What's more the Maxol is easy to buy, easy to install and easy to use.**

- Replaces present back boiler without fuss or bother.
- No more dirty grates to clean out.
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- Fits behind most gas fires.

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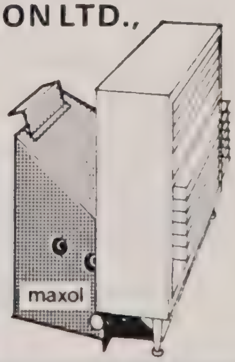
**maxol**



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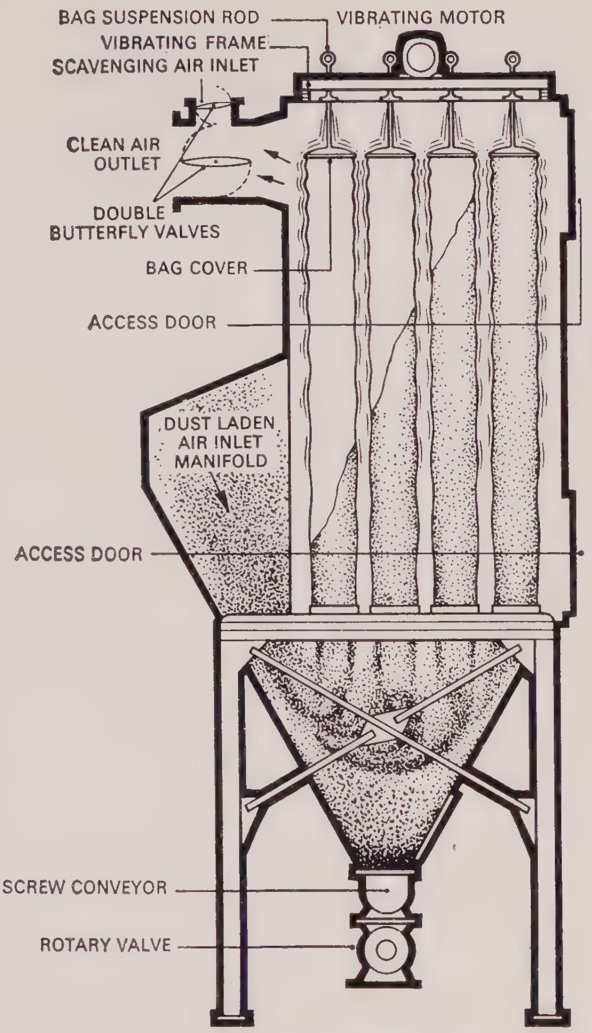

Section of Vibro Chamber Filter

# HOW BIG IS YOUR DUST PROBLEM?

A recent addition to the Holmes range of bag filters is the fully automatic Vibro Chamber Filter. An important design feature is the method of compartment isolation and bag vibration—the vibrating mechanism is designed to give maximum vibration at the top of the filter bags where the fine dust particles, normally difficult to dislodge, are collected. A collection efficiency in excess of 99% can be guaranteed for all particles above 0.5 microns.

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| 99% efficiency—0·005 microns and above | 99% efficiency—0·5 microns and above | 99% efficiency—3 microns and above | 95% efficiency—10 microns and above |
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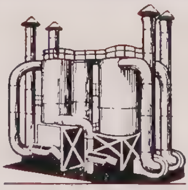
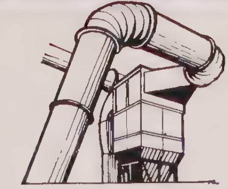
| <br>Electrical Precipitators | *Holmes are equipped to deal with any dust collection problem* | <br>Wet Arrestors | <br>Multi-cell Cyclones |

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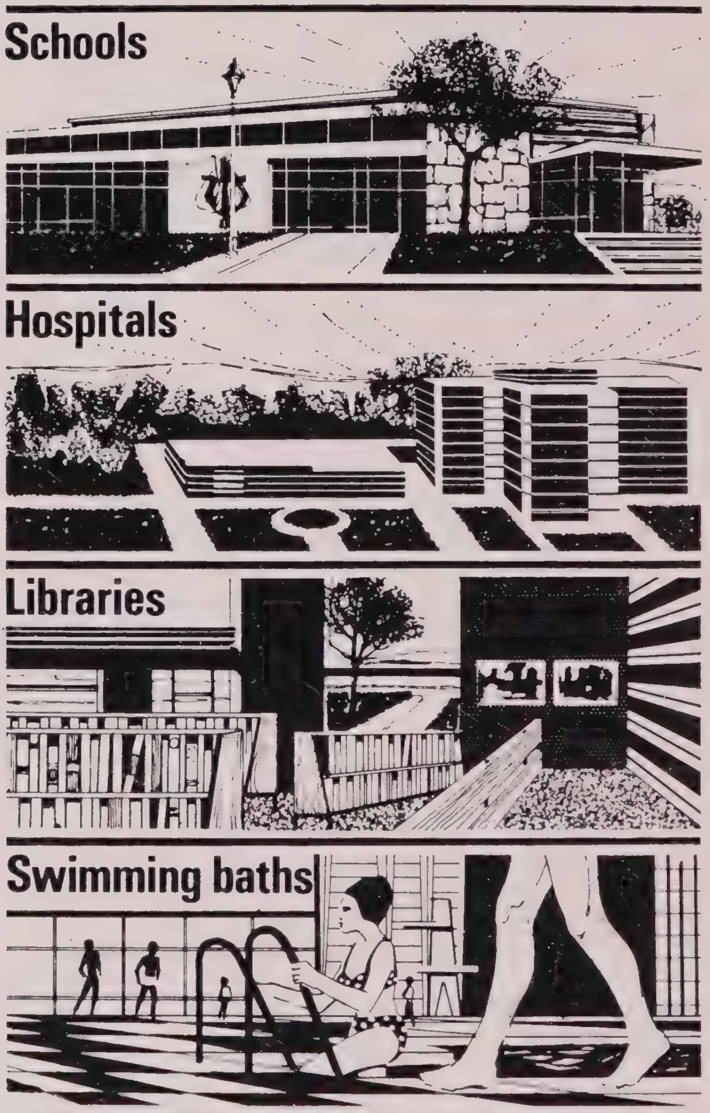

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JOURNAL OF THE
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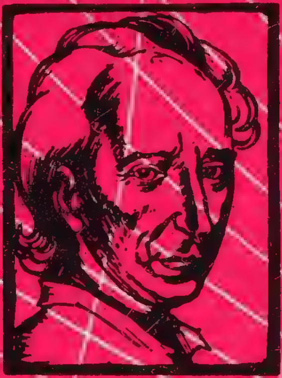
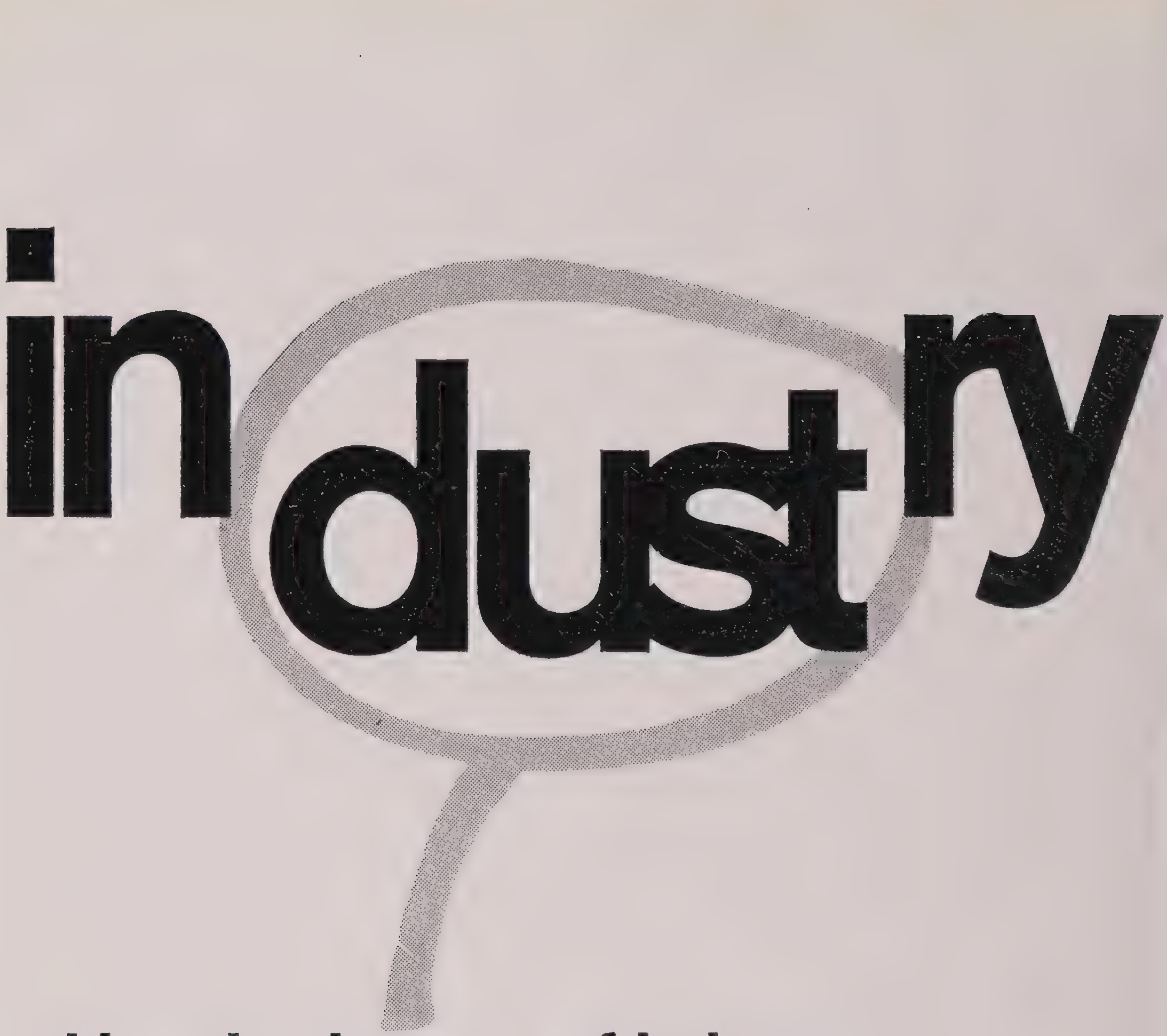


No. 144 ★ WINTER 1967 ★ 3s.

*In this Issue*

Blackpool Conference: Report, Address by Minister of State, Presidential Address, Abstracts
Air Pollution and Man's Environment ★ Reports from the Fuel Industries
1966 Estimates of Air Pollution



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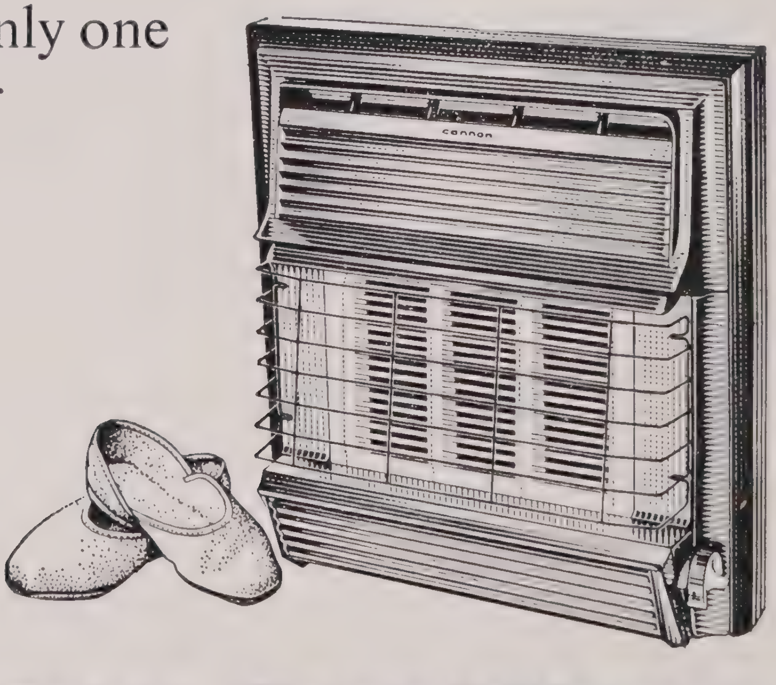

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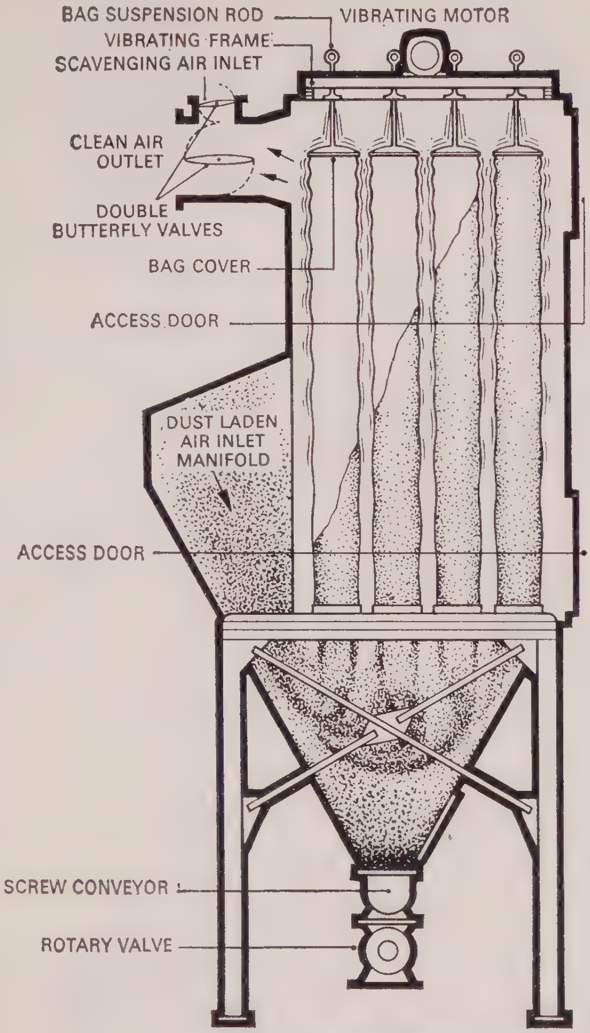

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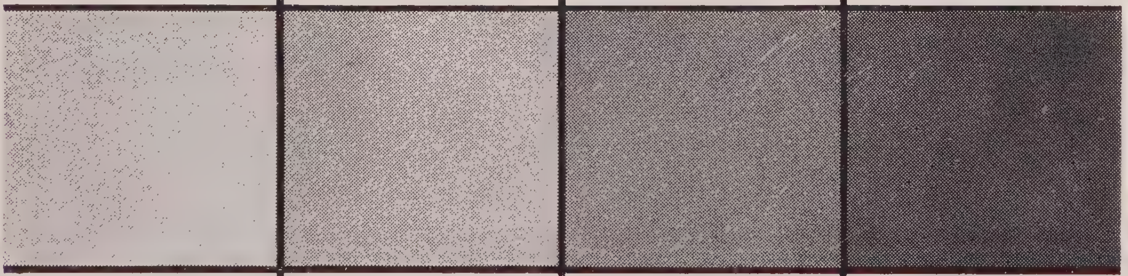

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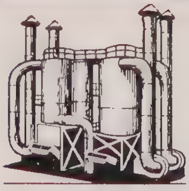
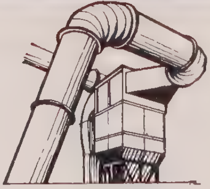


Wet Arrestors



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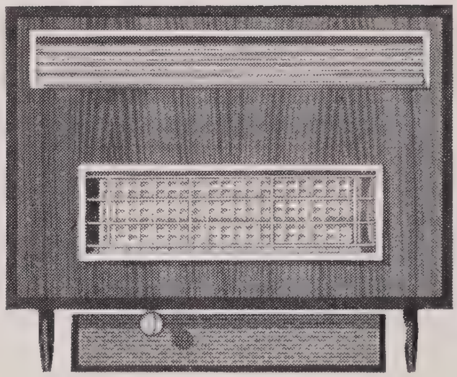

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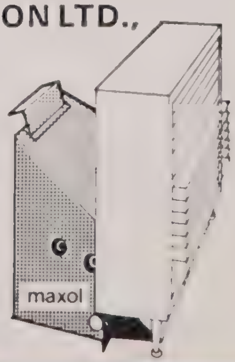

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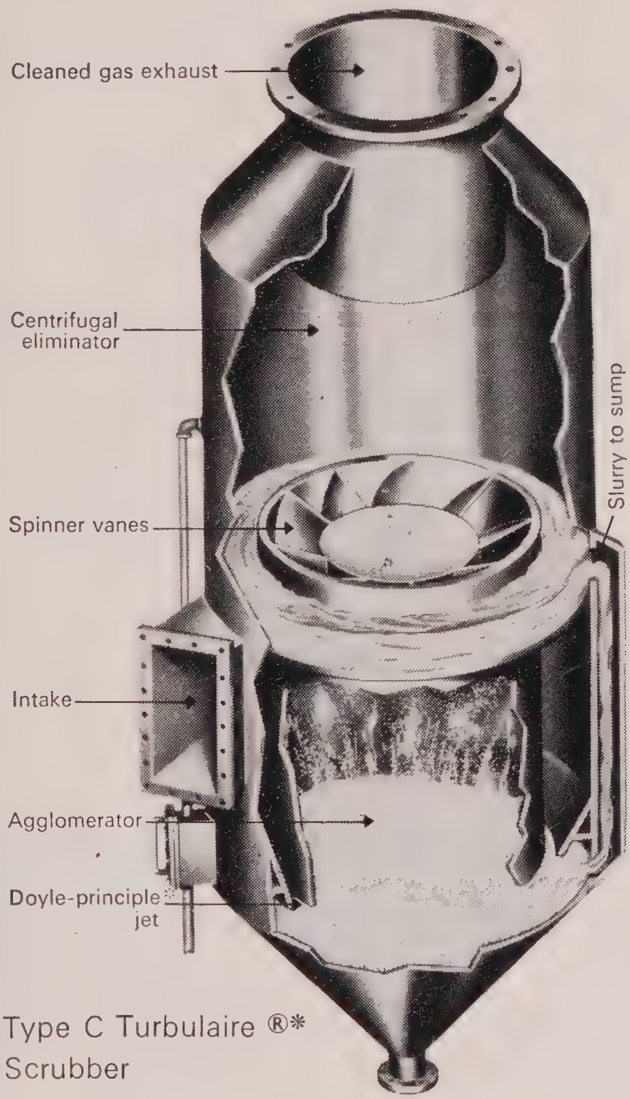

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**AT LEAST ON EVERY APPLIANCE**

**ON EVERY HOUSE...**

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## IT LIGHTS QUICKLY

(gas ignition optional), recovers quickly and burns to a fine ash the full range of smokeless fuels, such as Sunbrite, Coalite, Gloco and Rexco.

## CENTRAL HEATING TOO

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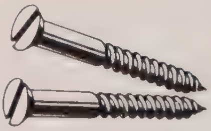
## IT IS FIXED WITH...



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The spreader stoker meets a wide range of boiler capacities.

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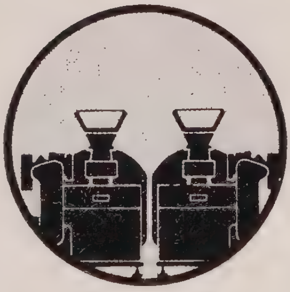

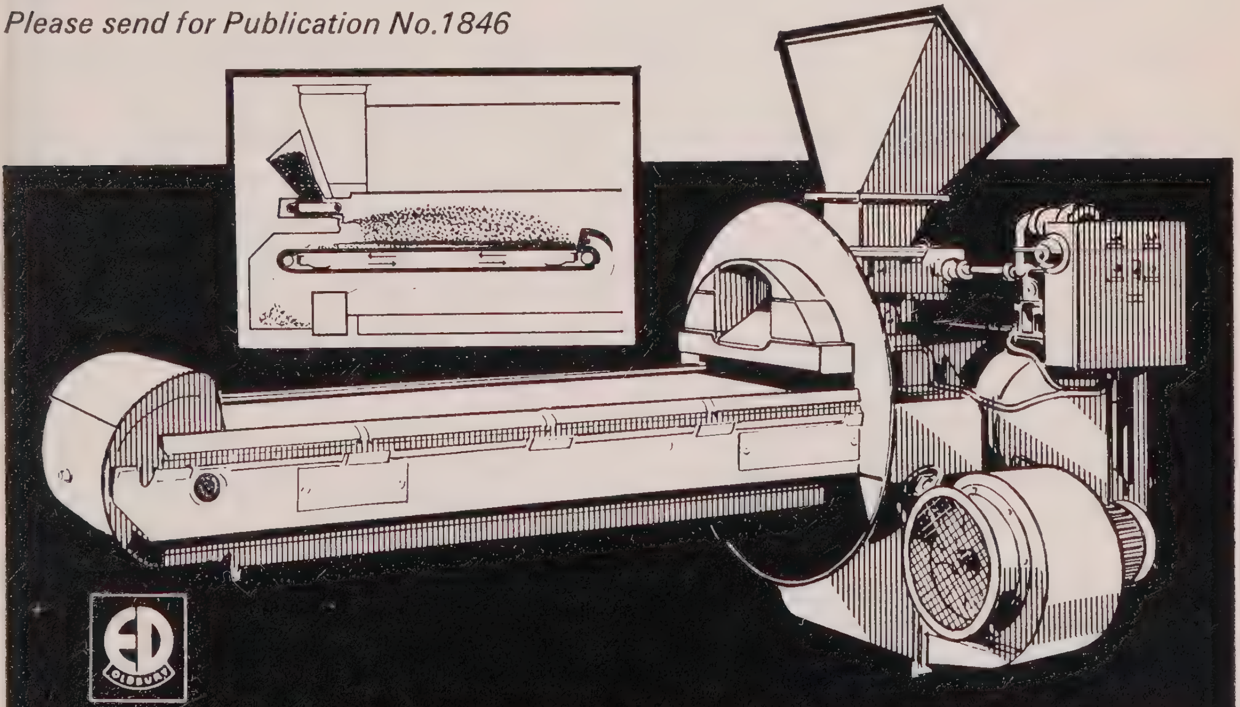

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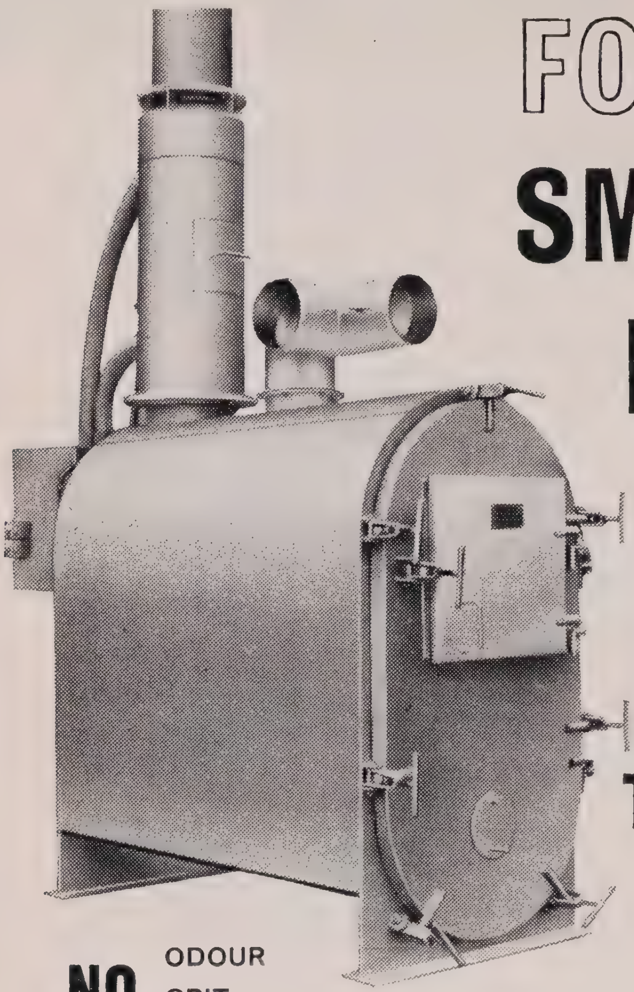

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**SMOKELESS DISPOSAL OF ANY REFUSE**

**The guaranteed Sealed Flame Incinerator**

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# SMOKELESS AIR

Vol. XXXVIII No. 144 Winter 1967

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: 01-242 5038 (Editorial and Advertising). Editor: Arnold Marsh; Asst. Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SKOKELESS AIR only, 12s. per annum, post free.

SMOKELESS AIR is the official organ of the Society, but the views expressed in contributed articles are not necessarily endorsed by the Society. Abstraction and quotation of matter are permitted, except where stated, provided that due acknowledgements, including the name and address of the Society, are made.

Technical articles of full page length, or over, in SMOKELESS AIR are indexed in British Technology Index.

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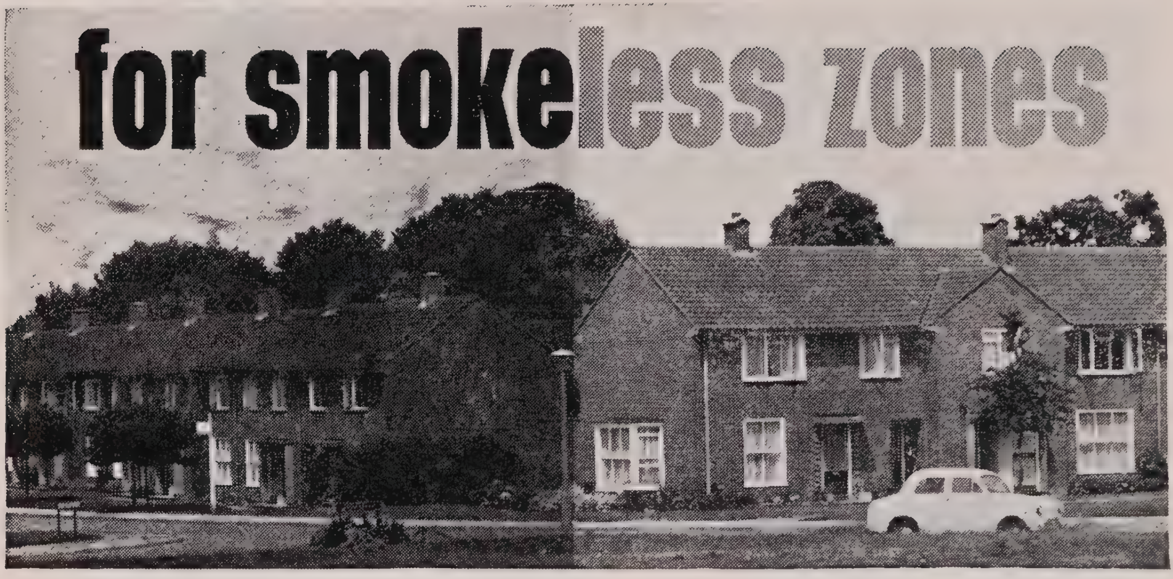

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"*A sane, balanced document*" (see p. 84)

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An NSCA Report

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Annual Conference and Exhibition, Harrogate, 22-25 October.

Mladen Grcevic, Zagreb

*Split, Yugoslavia*

*Ships, towers, domes, theatres and*
*temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the*
*smokeless air.*

# SMOKELESS AIR

## Nuclear Fall Out

FOR some reasons we would prefer to make no comment on what the Press inevitably called a row, arising from the provocative Des Vœux Memorial Lecture by Dr. E. Schumacher at the Blackpool conference. But among its other purposes this journal attempts to record all events in the history of the Society, and it would be a failure of duty if the controversy was ignored.

Dr. Schumacher, who is Economic Adviser to the National Coal Board, had been invited to make the subject of the Des Vœux Lecture "Clean Air and the Future Energy Pattern in Britain", but the major theme proved to be an all-out attack on nuclear energy policy on the grounds of its dangers. It was felt that although there is usually no need to permit discussion on the lecture, it was only fair and proper that on this occasion to give some opportunity for reply on behalf of those who very vigorously disagreed with the author. The appearance of a "row" was given credence by a strongly-worded press statement of rebuttal issued by the Ministry of Power. One newspaper even suggested the possibility of intervention by the Prime Minister! Nor did it escape attention that other salvoes of criticism of nuclear policy were currently being fired from the direction of Hobart House.

Although this particular skirmish was fought on the Society's platform, and although it was hinted that we ought not to have allowed it (to have done other would have invited much graver criticism), our main regret is that a highly important subject should not have been debated more freely at a more appropriate occasion. We are not proposing to enter into the controversy over the correctness or otherwise of Dr. Schumacher's extensively documented thesis, beyond saying that from the clean air viewpoint it is desirable that if there is a case it should be discussed with the fullest freedom on all sides.

Dr. Schumacher is a brilliant and compelling speaker, and his lecture was listened to with the utmost attention. So much so that we are sorry that the attention given to the nuclear policy section overshadowed the first part, in which he spoke, interestingly for an economist, on the way in which our civilization was in thraldom to economics, often to the detriment of our environment. This, too, might be regarded as provocative to some, but it was on a more philosophical level.

Fortunately, from our point of view, the disagreement—or fall out—does not seem to have been regarded by anyone as having been promoted or provoked by the Society. It nevertheless gave the conference far more publicity than it would otherwise have had, and publicity for clean air is always to be welcomed. Within limits.

## Patron Saint

In a lighter vein at Blackpool was the Mayor's jocular remark that as clean air was our objective, Blackpool could be our patron saint. We are in a little difficulty about following this up, because other seaside towns claim to have equally clean air, and have told us so at other conferences. We admit that the gale that welcomed us to Blackpool did bring clean air, and plenty of it, but all the resorts have their calmer days when pollution builds up just as it does in any other town that has not embarked on a smoke control programme. And only one seaside town has made a start—Southport.

A health resort, by definition, should be smoke-free, and we look forward to the time when some progressive seaside town (or inland spa) is able proudly to announce itself as Britain's first smokeless resort.

## *IUAPPA*

The International Union of Air Pollution Prevention Associations, with its headquarters transferred from London to Washington, in preparation for the second international congress in that city in 1970, has settled down to strengthening the organization and to active preparation for the congress. Dr. Christopher Barthel, Jr., has been confirmed as the new President, and Arnold Arch as the new secretary.

Since the London Congress in 1966 one new member has been added to the five founder-members: the Clean Air Society of Australia and New Zealand. Recruitment is bound to be slow, because the Union by its constitution is open only to bodies that are national in character and yet are non-governmental. Eligible bodies are few and far between, but it is hoped that the Union will be able actively to encourage their formation in a number of countries. It is hoped, too, to amend the constitution to allow some form of associate membership. On other activities, Dr. Barthel reports the setting up of four committees of the Executive Council, designated as: Public Awareness; Education and Training; Research and Development; and International Nomenclature and Standards. The work of these and any other committee will of necessity have to be conducted by correspondence.

## *Washington, 1970*

The Air Pollution Control Association, as the host organization for the 1970 second international congress, has already energetically begun to plan the event. The date will be 8 to 13 December, and the headquarters hotel will be the Sheraton Park. The meetings will no doubt also be held in the hotel, as is American practice.

Four main committees have been established "as fundamental to the success of the conference". They are: General Conference, Technical Papers and Programme, Entertainment, and Finance. In addition 12 other committees have been recommended: Facilities, Housing, Exhibits, Public Relations, Ladies, Registration, Tours and Transportation, Banquet, Protocol, Local Hosts, Printing, and Translations. But, it is pointed out, as plans evolve, it may be necessary to establish additional committees or sub-committees.

The member associations are to be asked to make suggestions and to involve their representatives in the operations and conduct of the conference, and to appoint a representative to the programme committee.

We must confess to being somewhat awestruck by this organizational thoroughness, which gives a positively primitive look to the way in which the London congress was organized, by just one conference committee under the Executive Council.

## *500 m.p.c.*

500 miles per charge of battery is the new prospect announced for the electric car. The British Motor Corporation says that the proposed metal-air battery, of Anglo-American development, will be only half as big again as that used in a conventional petrol engine car. Eventually zinc-air batteries up to twelve times the capacity of lead-acid accumulators will be made in Britain by Crompton Parkinson at Newport. A 500 mile, or ten hour,

# NEW DIRECTOR APPOINTED

The present Director and Secretary of the Society, Arnold Marsh, is to retire at the end of May, 1968, after forty years of service with the Society. He will be succeeded by Rear Admiral P. G. Sharp, C.B., D.S.C., who has recently retired from the Royal Navy. Rear Admiral Sharp, whose career began in the north in the insurance world, served in the R.N.V.R. during the war, at sea except when a prisoner of war, and in 1945 was selected for permanent Royal Navy. During the past 22 years he has had considerable experience in organizational and administrative work and important commands, including that of Commodore of the Royal Naval Barracks, Portsmouth, and, at the time of his retirement, as Flag Officer Sea Training.

Rear Admiral Sharp will join the Society on 1 January, 1968, as Director-Designate, to work with the present Director until he takes over in June.

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run on a single charge brightens tremendously the prospects for the electric car. With service stations at which batteries could be exchanged, or re-charged during a rest or meal period, the electric town car could easily become a touring car.

Another interesting development in electric cars is reported from Alastair Carter of a Tamworth engineering company. Using at first only four conventional batteries, the prototype Carter-Coaster car will be specially designed for lightness to offset the battery weight, and will have a motor fitted to each rear wheel. The basic cost of the car will be about £300, and fuel costs will work out at about 10 miles for a penny. Top speed will be about 40 m.p.h., with acceleration from start to 30 m.p.h. in seven seconds.

There is also much activity in the U.S.A. in electric vehicles, and the next few years will undoubtedly see substantial developments in what the Americans have termed the zero emission car. On the other hand the chairman of the Mobil company is reported to have said that pollution from petrol vehicles will have been virtually eliminated before the electric car is fully developed.

## *More on* $SO_2$

There seems always to be news about new processes for the removal of sulphur dioxide from flue gases. Of particular interest is a process from the U.S.A. that has been examined by the C.E.G.B. in this country. Not only has further progress been made here in development, but design of the plant required has gone ahead, with the result that Britain is at present in advance of the States in this process. It would be possible, through the sulphur that can be recovered in commercially useful form, largely to offset or even recover the cost of extraction.

A different process, recently reported from the U.S.A., has been developed by Wellman-Lord, and has been effectively demonstrated by the successful operation of a pilot plant at the Gannon Power Station in Florida. The process involves a chemical absorbent reaction with the $SO_2$ recovered as a pure, anhydrous liquid that can be shipped in this form or converted to elemental sulphur or to sulphuric acid. On current sulphur prices it is claimed there would be an attractive return on capital investment.

One serious aspect of the development of such processes—which are likely to be suitable only for very large installations such as power stations—is that at best they are bound to take some years to develop to full working capacity, and by that time the increasing use of nuclear energy will be progressively diminishing their need.

# Address to the Conference

## By Stephen Swingler, M.P., Minister of State, Ministry of Transport, in opening the Blackpool Conference

I COUNT it a privilege to be invited to address this conference. The National Society for Clean Air has a distinguished record, a record of improving the environment in which we live and, I might add, of improving it in the one of its most fundamental aspects—the air we breathe.

As you all know the Ministry of Transport is deeply concerned at the moment with the air we breathe. Indeed we have arranged for policemen to examine it at frequent intervals!

More seriously: the Ministry is like you, concerned with the environment. We are concerned that we should be free to move about our great cities in an atmosphere of comfort and civilization. We are concerned that our roads should be safe and that they should be so designed that motor vehicles do not impinge disastrously on our daily lives.

Environment is a vague word. It means all things to all men. But to us at the Ministry it represents something very important—the very quality of civilization which in a technological age we now have better means to create and safeguard than ever before but which that very technology itself sometimes impedes.

In declaring this conference open I want naturally to refer to the aspect of the problem of environment which concerns you and me especially—the problem of the pollution of the air by vehicles.

I have read the excellent report on Air Pollution from Road Vehicles which has been produced by your technical committee. It is a sane, balanced document. It brings out the point that the pollution we suffer from vehicles is relatively slight. There are worse sources of pollution. But it leaves us with no grounds for complacency.

Pollution from vehicles may not be a proven hazard to health, but it is exceedingly unpleasant. To drive behind a diesel lorry belching black smoke is to pay the full price of modern technology. The reek of petrol fumes hanging over a city street on a summer's day is no pleasure.

And these in fact—so far as motor vehicles are concerned—are the two chief menaces: smoke from diesels and the invisible fumes from petrol engines.

The diesel smoke may be the most visible and the most obvious—but it happens to be the simpler problem. Let me deal with it first. It is noisome. It can be dangerous, because in really bad cases it may obscure a driver's vision. But there is no evidence to show that the amounts we get in the air in our streets at the moment is harmful to health. This is the considered opinion of the Government's medical advisers who have made very careful studies of its effects. Of course research continues, but, I repeat, for the present we have no reason to suppose it does us any harm.

This does not mean that we can ignore the problem. If we care about the environment, then we must care about more than health. The Government's aim therefore is to reduce the emission of diesel smoke to the absolute minimum by careful and regular maintenance and adjustment of vehicles. Unfortunately not every operator will do this—so we have had to make regulations. The regulations are fairly technical, but the upshot of them is that it is illegal to use a vehicle in such a condition that it emits excessive smoke and may endanger persons or property or to use improperly the excess fuel starting device which can

*Blackpool Conference opening. Left to right: Stanley E. Cohen, Hon. Treasurer; Sir John Charrington, President; Alderman Leslie Pilkington, J.P., Mayor of Blackpool; Stephen Swingler, M.P., Minister of State, Ministry of Transport*

lead to smoke emission.

But this is not all. In addition the Ministry vehicle examiners have a most important power. They can prohibit the use of a laden goods vehicle until faults—*including excessive smoke emission*—have been put right. And I must emphasize that the knowledge that this can happen is, in our experience, a far bigger deterrent than the threat of prosecution followed by a fine. But we do not regard these powers as sufficient.

We have taken the opportunity of the Road Safety Act passed by Parliament earlier this year to promote a number of measures which—directly or indirectly—will all help to control this problem of smoke emission.

There are three measures which are relevant:

1. We have extended the powers of the vehicle examiners so that they can now prohibit the use of goods vehicles unladen as well as loaded.

2. From next year we are introducing a scheme for the annual testing of heavier goods vehicles—and this will include a check to make sure that they are not in a state to cause or be likely to cause smoke emission.

3. The Act also gives us powers to bring a scheme of 'type approval' which will enable the Ministry to approve vehicles at the design stage and thus effectively control their technical specification and performance.

This will enable us to ensure that vehicles are not underpowered for the loads they will be carrying—one of the main causes of smoke emission—and it will also enable us to see that the engines fitted to vehicles comply with the recently issued British Standard which, for the first time, includes maximum levels of smoke emission.

All this amounts to solid progress—in fact or in prospect.

Now let me turn to the more complex problem of fumes emitted from petrol engines. Petrol fumes contain many pollutants. The one we are most concerned about is carbon monoxide. To a lesser extent we are concerned about hydrocarbons. Carbon monoxide, if it occurs in sufficient concentrations, can kill. In less concentrations it can cause headaches, nausea and giddiness. There is some evidence to suggest that in smaller quantities it may impair the senses at least temporarily, and this is important because drivers affected in this way would be a safety hazard.

But we do not yet know enough about the problem to take sensible action. A good deal of research is therefore in hand. The Warren Spring Laboratory of the Ministry of Technology is measuring the amounts of carbon monoxide commonly found in the streets of larger cities. At the same time the Air Pollution Research Unit of the Medical Research Council is seeking to assess whether the quantities of the gas found in the blood of drivers is enough to have any significant medical effects.

So far this research is reassuringly negative. There is as yet no evidence that the concentrations of carbon monoxide found in the blood has any significant effect. And there is, I am happy to say, no reason to suppose that the concentrations in our streets are enough to give rise to significant effect. However the research is not yet complete. It is being pressed ahead as a matter of urgency and when we have the full results we shall be looking into them very thoroughly and very promptly to see what—if any action—we should take.

But the fact that there is no evidence at the moment of a medical risk or a safety risk does not mean that we can assume all is right.

The motor industry itself is very much alive to the problem and manufacturers, I know, are very busy trying to find ways of cutting down on the emission of fumes, for example, by improved carburettors and engine design.

Hydrocarbons, as I said, are of lesser importance at any rate in this country. In Los Angeles they are a partial cause of the phenomenon of smog. The various conditions which cause smog do not occur here at present and in any case many new cars now are equipped with devices to control fumes coming from the crankcase.

And this, of course, raises the question: why does the Ministry not make regulations to control fumes emitted from the exhaust pipe or the crankcase? The answer is that at the moment we do not see how such regulations could be made to work. In the last analysis any such regulation would have to be enforced by the police. Unfortunately it would be virtually impossible for a policeman to tell whether a device to control these fumes was being maintained so as to be effective or not.

To measure the quantity of a gas—e.g. carbon monoxide—which a vehicle is emitting you need a laboratory or a specially equipped garage. It just cannot be done by a roadside check. This is why we are tackling this problem by improving vehicle design rather than by regulation. This is the way we shall most effectively achieve results.

I should like to stress here that we regard these problems as international ones that we are working closely with other countries to get the right solution.

We take a leading part in the specialist working group on air pollution which has been set up under the Economic Commission for Europe. The group has in fact agreed on an 'engine-operating test cycle' which provides the equivalent of a short, typical car journey involving starting, accelerating, cruising, stopping and so on. The value of this is that the test cycle could be used to work out what limits should be placed on exhaust emission if we should decide that limits are needed: The cycle is now being tested and the group are looking at other forms of vehicle pollution, the standardization of measuring diesel smoke and instruments for making such measurements.

I mention this international work because we are often pressed to apply in this country the same sort of regulations on vehicle emissions which they now have in the United States. Their regulations are very stringent—but then they have a much more serious problem than we do. A drawback of these regulations is that they add considerably to the cost of vehicles. That of course is not a barrier to introducing them—but we have yet to be convinced that we cannot successfully tackle the problem by other means. You know, it is *not* a simple problem.

A lot of people seem to imagine that all we have to do is fit a little black box to the exhaust pipe and then our street will be sweet and clean again. I don't know what sort of black magic anyone expects from a black box, but I do assure this conference that the Ministry of Transport and other Government departments have exhaustively examined many different filtering devices. For various reasons none of them have proved workable.

Our attack on this whole problem of pollution by vehicles is therefore on several fronts: enforcement where that is practicable; research where that is needed; better design where it will help; international co-operation all the time.

I believe this is the effective way to deal with the problems. But I recognize that it is not an exciting or dramatic approach. Only a tip of the iceberg of what we are doing shows above the surface. The message I want to give to this conference is that we are getting on with the job and that we are not complacent about the size or urgency of it.

With that message I declare this conference open, and wish your deliberations all success.

*Blackpool Conference*

# The Presidential Address

## by Sir John Charrington

THE papers to be presented at the sessions to follow cover so many aspects of the problem of air pollution as it is today, that it would be difficult not to impinge on one or more in this address if it sought to go into any subject in detail. Perhaps to look briefly at the programme and the significance of the papers will be the wisest thing to do.

The papers are all concerned with the important problems that still confront this Society, but to begin with it might be interesting to take stock of some of the problems that no longer need to be discussed. There is, for example, that of railway smoke: once an important and serious item at conferences such as this. It has of course now almost disappeared. And, although you are to discuss industrial grit and dust, there is no paper on industrial smoke. Thanks to the drive for fuel efficiency, the Clean Air Act, and the availability of better fuel-burning plant, equipment and instruments, industrial smoke is steadily disappearing, and as the older plant becomes obsolescent it must before long disappear altogether. The work done by the Alkali Inspectors should not be overlooked.

Again, you are no longer having to discuss the problem of pollution from the pottery industry. That too has almost disappeared—except for one or two more difficult processes. Nor have you found it necessary in recent years to look at problems that used to be associated with electricity generation and gas-making.

All this indicates what great advances to clean air have been made in recent years—advances in which the Society has played the leading part.

Nevertheless, as the conference programme shows, there are still problems to be solved. This afternoon you will be discussing the one general problem that is growing rather than diminishing: the fumes, gases and smoke from motor vehicles. The Technical Committee's report, which is to be introduced and outlined by Dr. Parker, is a valuable description and analysis of

*The Opening Platform. Left to right: Miss N. Kenyon, Chairman, N.W. Division; Dr. W. C. Turner, Deputy Chairman; A. C. Saword, Chairman; the Mayor of Blackpool; the President; the Minister; the Hon. Treasurer; and S. Cayton, Deputy Chairman*

the problem, and a constructive statement of action that should be taken. It should do much to clarify a situation about which there is much confused thinking. I would like to take this opportunity to pay a tribute to Mr. Cohen, our Treasurer, who was the first to raise this subject at the Clean Air Council.

The publication of the report has closely followed the Ministry of Transport report on "Cars for Cities", which includes a section on the air pollution problem. Our own report, I think, supports and complements, and in some respects goes further than the official report, and is therefore of value in its own right. For one thing it focuses single-minded attention on this one particular problem, whereas in "Cars for Cities" this is overshadowed by the many other questions that are examined.

On air pollution generally the Clean Air Act has now amply proved its worth, but naturally after 11 years some shortcomings have become apparent. A valiant effort was made by Robert Edwards, M.P., to secure some improvements through a Private Member's Bill. That Bill has now been withdrawn, but a new one is to be introduced, with Government support, and will cover, we hope, a wider field. This is something in which the Society is vitally interested, and its Parliamentary and Local Government Committee is just completing a memorandum, in which are made eight separate proposals for strengthening the Clean Air Act. These have evolved from the discussion you held on the subject at the meeting in 1966 to review the first decade of the Act.

The household smoke problem must still come first in the deliberations of the Society, although you have discussed it in every aspect over the years. This time just one session is devoted to it, when there will be a paper on the economics of smoke control areas, and a report on what is, or is not, being done by local authorities to ensure that new housing is smokeless from the start.

### Domestic Smoke

Progress in domestic smoke control has been disappointingly slow to many of us, and although it is encouraging that London is now well past the halfway mark to its final target, other parts of the country remain a long way behind. This is especially the case in the North, where smoke control is in fact needed much more urgently, but I understand local authorities in the North West are pushing ahead with their plans for clean air.

It is only fair, perhaps, to add that the old problem of concessionary coal remains a difficulty in areas largely populated by coal miners.

For the progress we want, I need hardly stress to this audience, a very great deal depends on the fuel situation over the next few years. That is with respect to both the availability and the cost of the various methods of achieving smokelessness in the home. Gas, electricity, oil and solid smokeless fuels, all have their parts to play, and the future of each one of these four groups raises speculations, hopes, and perhaps some doubts. The new fuel policy for the nation on which the Ministry of Power have been working laboriously—and it is no easy task—will, it is hoped, shed new light on our particular aspect of the situation, and we may hope that it will bring encouragement to the clean air movement.

You may be expecting me to say something in particular about the solid smokeless fuels. This I propose to do, not simply because of my background interest in them, but because, despite all the important contributions being made by the other fuels, it is the solid fuels that give rise to so many questions and so much debate. A great deal depends on them especially with respect to their availability. Let us therefore look at some of the facts of the situation.

The Ministry of Power's White Paper "Domestic Fuel Supplies and the Clean Air Policy" issued in December, 1963, suggested that if clean air development progressed at the speed proposed by local authorities there could be a shortage of open fire solid smokeless fuels commencing in 1965 leading to a shortage of $1\frac{1}{2}$ million tons by 1970.

However, partly because smoke control areas have not come into operation as rapidly as forecast and partly because output of solid smokeless fuels has increased satisfactorily, there has been no general shortage of solid smokeless fuels, although there have been difficulties with particular qualities.

As for the future, whilst a steady decline in the production of gas coke must be expected, the production of most other kinds of solid smokeless fuel is growing and I am not apprehensive about the outlook.

Since 1963 "Coalite" has doubled the capacity of its Askern Works and extended its Bolsover Plant, whilst a new plant built in Grimethorpe is now in full production. "Rexco" have built a new plant in Scotland and another at Ollerton. The annual tonnage of low temperature carbonized fuels has doubled since 1963. In addition a respectable tonnage of BurnBrite is also available on the market. Multiheat, a new fuel not mentioned in the White Paper, introduced by the National Coal Board is being produced at a rate of 110,000 tons per year and will be increased to 330,000 tons per year by 1968. The amount of Sunbrite available for the domestic market continues to increase.

When the gas industry realized it was no longer economical to produce gas by the carbonization of coal, it was inevitable that the make of gas coke, upon which we had largely depended in the past, would be reduced year by year; and it can be seen that we should have been in a considerable difficulty for solid smokeless open fire fuel had there not been the admirable development by the Coalite and Rexco private enterprise concerns.

The paper on air pollution in relation to the North-West economic environment should be mentioned here. The North-West, or many parts of it, suffered intensely in the 19th century from the industry and growth of population that made it one of Britain's greatest manufacturing areas. It has still a long way to go before it can again show a clean face.

To remind us that all industrial problems are not yet solved there is the paper on grit and dust control, and that on the disposal of waste materials, without creating pollution; as well as the one on the remarkable new process in steel-making that uses oxygen without the emission of intolerable fumes.

The iron and steel industry has made great efforts, and expended much money, in overcoming its formidable pollution problems and so in fact have other industries. This welcome and enlightened attitude contrasts gratifyingly with the suspicion and even opposition with which industry once viewed the apostles of clean air.

Some of the most difficult industrial problems, and perhaps the most harmful are encountered only locally, and are therefore apt to escape general attention. That some of these hazards still continue can be seen by studying the annual reports of the Chief Alkali Inspectors, and more specifically some of them will be brought before you this afternoon in an important medical paper.

One of the Society's functions throughout its history has been the promotion of the case for clean air by making known the harm done by pollution. Sometimes one may think that the last word must have been said on this; but there is always something new and important, whether it is in respect to the harm done to health, to vegetation, or to materials and property. That is why the two papers you are to receive on corrosion fit so admirably in the scheme of the programme. Everyone today accepts that clean air is a good thing, but there are still people who have only the vaguest understanding of its practical importance, and on the scale of the losses that we—and they—suffer because of it.

There is thus still a great deal of work to be done on this task of public enlightenment, and although the Society has done much—with meagre resources—in education, information, the encouragement of research, and in acting as the driving force for clean air in this country—and maybe throughout the world—its objectives are not yet attained, and it must continue to press on with its cause.

*A general view of the Empress Ballroom, with the conference in session*

# BLACKPOOL CONFERENCE

## *A General Report*

ATTENDED by 800 delegates, the Society's 33rd annual conference in October can be reckoned as one of the most successful—and to record the view of many—one of the most enjoyable. The weather may not have been too kind, but this was more than made up for by the warm welcome and hospitality received from the town, and especially from the Mayor, his colleagues and officers. The programme of papers was well varied (details were given in our Summer issue), as the abstracts of the papers given on another page will show.

The conference started on the morning of Tuesday, 17 October, with a felicitous civic welcome from the Mayor, Alderman Leslie Pilkington, J.P. Then followed a formal opening by Stephen Swingler, M.P., Minister of State, Ministry of Transport, whose address is reported elsewhere in this issue. Sir John Charrington, in the chair, then delivered his first Presidential address.

It would be invidious to single out any of the papers for special mention, for all were of considerable interest in their particular field, and the discussions upon them were of good quality and to the point. After the final session on the Friday morning, stemming from the presentation of the Technical Committee's report on *Air Pollution from Road Vehicles*, the following resolution was moved and unanimously adopted:

> "That this conference draws to the attention of the Minister of Transport the Society's report on *Air Pollution from Road Vehicles*, which shows that it is now technically feasible to reduce the emissions of petrol engined vehicle carbon monoxide and diesel road vehicle engine smoke to acceptable levels, so that legislation can now be enacted to set suitable limits by a reasonable date."

At the very end a general vote of thanks was moved by Alderman C. Willetts of Halesowen, and was carried with much applause. It included reference to the authors of the papers, the sessional chairmen, the Conference Committee, and the Society's staff; and especially to the Mayor and Corporation of Blackpool for their outstanding hospitality and the friendly reception they had given to the conference, and to the officers of the Corporation and the Blackpool Tower Company for all they had done in the organization of both the conference and the exhibition.

*Dr. E. Schumacher at the rostrum*

The social events included the informal "get together" on the Monday evening, which was as crowded and as animated as ever; the enjoyable reception and dance given by the Mayor and Mayoress on the Wednesday evening; and the conference dinner, with dancing and cabaret. The dinner was in place of the luncheon of recent years, and although attended by only some 200 delegates and guests, with their ladies, it was most successful, both at the table and afterwards. At the dinner A. C. Saword, Chairman of the Executive Council, proposed a toast to the Mayor and Corporation of Blackpool, to which the Mayor responded. Francis Waring, of Coalite, representing the exhibitors, proposed a toast to the Society, and referred particularly to the Director, whose last conference in that capacity it would be. Arnold Marsh, responding, pointed out that Coalite was in fact the Society's oldest exhibitor, having had a demonstration at his first conference—the last of the old Smoke Abatement League—at Harrogate in 1928.

**The Technical Visits**

There was no session on the Wednesday afternoon, when a series of visits were organized for those who wished to participate. We are indebted to the delegates whose names are given for the following reports on the visits.

*Blackburn Civic Centre*

Sixty-nine delegates were shown the re-development project of the city centre. It was apparent that this ambitious scheme not only provided the citizens of this town with a fine new town centre but, by the demolition of all the old houses, has resulted in a smoke-free area. After a welcome by the Mayor the party enjoyed a buffet tea and Mr. W. J. Pennington thanked the Mayor for their hospitality to the delegates. *W. J. Pennington*

*Parkside Colliery and*
*Anderton House Computer Centre*

Fifteen delegates visited the colliery, ten of whom elected to enter the pit and were taken down to the second level, approximately 800 yards deep, to the coal face, where coal of medium grade was being cut by mechanical equipment from a seam about 50 inches in width and taken by conveyor belt and train to the shaft bottom. The party was very impressed by the mechanization efficiency and safety measures adopted as well as the cheerfulness of the comparatively few miners encountered. The rest of the party were shown the impressive surface engineering and coal cleaning and grading plant etc.

*The President, watched by Mr. Swingler, tests his lung capacity at the Cancer Information Association stand in the exhibition (he scored an excellent rating!)*

A visit to Anderton House, the National Coal Board Computer Centre, concluded the afternoon. The party was received by W. Holdsworth, General Manager, C. Brown, Sales Manager, and other engineers at the Colliery and by E. Entwistle, Senior Engineer at the Computer Centre, where a further party of delegates, led by Dr. R. M. Gordon, joined forces for tea. The visit underground was considered worthwhile although strenuous and some people were rather black about the eyes well after the Civic Reception in the evening. *G. W. Dhenin*

*Pilkington Glass Works*

A group of 37 delegates visited Pilkington Glass Works, St. Helens. The party was received at the main building of the works by J. J. Whitehart and F. P. Lockwood.

After an introductory talk and refreshments a buffet luncheon was provided by the firm in their modern

*Ladies' party being welcomed at Kendal by E. S. Bulmer, N. W. Electricity Board Lakeland Chairman, and Mrs. Bulmer*

reception lounge. The party was then split into four groups led by representatives of the firm and escorted through the sheet glass section of the works. Interesting information was given regarding the preparation of the basic materials for glass making and inspection of the furnaces followed, with demonstration of the enormous heat created and the manner in which the viscous material was drawn up into sheets, cooled and cut. A visit to the experimental section then followed and explanation was given of the methods adopted to formulate improvements and assess the general efficiency of the prevailing systems in operation. New techniques are very much to the fore and constant investigation is made into the whole field of glass production. The firm has very extensive connections throughout the world and employs many thousands of workers in the glass industry generally.

After the tour of the sheet glass section it was possible to have a short tour of the magnificent museum erected in a modern building by the firm and, it was noted, open to the public on occasions. In this museum the history of glass making is amply illustrated with some beautiful exhibits, old and new, and the delegates were unanimous in their praise of the whole museum. The general opinion was that a tour of the museum at leisure would have proved an amply rewarding experience.

Tea was served in the canteen after the visit to the museum and W. Combey expressed, on behalf of the delegates, their great appreciation for the helpful attitude of staff, the excellent way in which the firm's activities had been demonstrated, and for the excellent catering arrangements. Mr. Lockwood replied by saying that the Company were happy to have afforded the Society's delegates this opportunity for a visit and said that they were keenly interested in Clean Air measures which he felt were practically demonstrated by the absence of visible pollution from the factory plant. *W. Combey*

*Leyland Motor Corporation*

Leaving Blackpool at 10.00 a.m. a coachload of 33 delegates travelled to the Farington Works, Leyland and toured the vehicle assembly plant. After being entertained to lunch by the Company the party visited the Spurrier Works where all aspects of engine construction were viewed. The power plant and the apprentice training school were found to be particularly interesting. As the party was broken up into small groups under the leadership of technicians, the visit presented an excellent opportunity to ask questions related to the refinements of modern vehicle and engine construction. At the conclusion of the visit, A. J. Clarke, the leader of the party, thanked the Leyland Motor Corporation for their hospitality to the delegates.

**Ladies' Visits**

Throughout the week of the conference opportunities were provided for delegates' ladies to take part in a full and varied programme of activities. On Tuesday afternoon a visit was made to Marks & Spencers store in Bank Hey Street, where the Manageress and her assistant took them "behind the scenes". While this group observed the customer from the shop assistants' angle, another group were the guests of the Women's Advisory Council on Solid Fuel at the Sales Office of the National Coal Board in Talbot Street. Miss Clifton of the Women's Advisory Council on Solid Fuel gave the ladies an insight into the niceties of preparing for hostess and summer dinner parties, after which the group were entertained to tea.

On Wednesday a Blackpool Corporation Bus took a party of ladies to the modern bakery of Cookson & Sons at Lytham St. Annes. Here an opportunity was provided to view the many and varied aspects of bread and confectionery making in a visit which occupied two hours. At the conclusion of the visit the ladies were the guests of Cookson & Sons for afternoon tea. A large party, meanwhile, were having the intricacies of modern coiffure and wig design explained to them by Mr. George, a well-known Blackpool hair stylist, in the theatre of the North Western Gas Board Showrooms, almost adjacent to the Winter Gardens. Home Service Advisers of the North Western Gas Board demonstrated modern cooking methods and at the end of a very interesting afternoon, which included a welcome from J. W. Rodgers, cocktail savouries and sherry were served to the party.

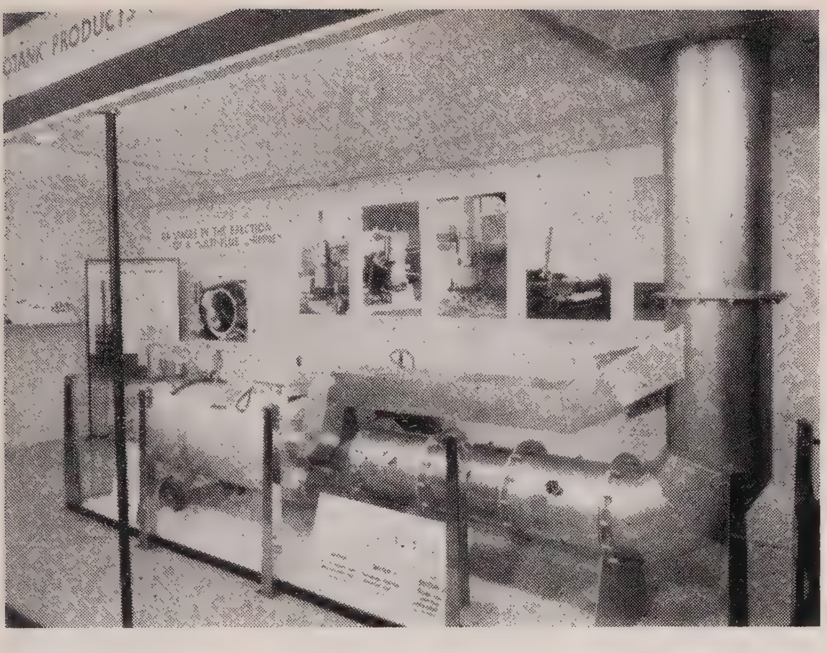
The week's activities concluded with a visit to Lakeland by a coachload of ladies who were guests of the North Western Electricity Board. The inclement weather that had plagued the conference gave way to a sunny, clear morning, providing a rare opportunity to view the beauties of Windermere and the countryside en route from there to Kendal. Buffet lunch was served at Heaves Hotel. On arrival at the Service Centre, Kendal, and the Castle Green Office of the Board, talks were given on electricity supply in the Lakeland area. A very pleasant and full day concluded with tea and the return journey by coach direct to Blackpool.

A large proportion of delegates' ladies were able to take part in these activities, made possible by the cooperation and active help of the Boards and their staff. The conference is indebted to them for the high standard of hospitality extended and also to the management of Marks & Spencers in Blackpool and Cookson & Sons at Lytham St. Annes. Also to those ladies who valiantly undertook the leadership of parties on these occasions.

## THE EXHIBITION

This year's exhibition, which was held on the Leopold Grove Exhibition Floor, Winter Gardens, Blackpool, consisted of exhibits from the various fuel industries, chimney constructors, incinerator manufacturers, technology, air pollution information, boilers and domestic heating systems.

The exhibition was opened by Stephen Swingler, M.P., Minister of State, Ministry of Transport, on Tuesday, 17 October, after the opening session of the conference. At the opening of the exhibition the Minister voiced his whole-hearted support for the work the Society is carrying out, and further asked industry to add its support. Reference was also made to road vehicle pollution and the necessity of more stringent laws, and the development of new forms of propulsion. A tour of the exhibition was then made, giving the Minister, accom-



*The Thermotank Ltd. stand in the exhibition, showing the Dribore double skin insulated chimney*

panied by the President and officers of the Society, a chance to see the developments each exhibitor makes in support of clean air.

The exhibits included companies displaying equipment for analysing pollutants, technology of air pollution, developments of domestic and industrial heating systems, the usage of solid fuel, gas, oil, and electricity, smokeless disposal of refuse, electric transport, electrostatic precipitators, chimneys and steeplejack services, boilers, fuel storage, and clean air information.

As a mark of respect we give special mention to the stand of Coalite & Chemical Products Ltd., who celebrated their 50th anniversary year by drawing attention to this occasion with an extremely effective construction. We wish them every success during the course of the next 50 years, and hope that they will continue to support the Society.

The 1968 Clean Air Exhibition to be held in the North and South Halls, Harrogate on 40,000 sq. ft. of floor space is already well under way. Among other features, a theme for this event will be working machinery of all categories both on outside space and under cover. Already one-third of the space has been booked, and there is hope of international support for this event.

**The Golf Tournament**

From a field of 29 competitors for the Solid Smokeless Fuels Federation Cup, came the winner W. Bate, Chief Public Health Inspector, City of Cardiff, who was closely followed home by two joint runners-up Alderman A. Hinchsliff of Rawtenstall, Lancashire, and E. A. Stokes, M.B.E., of Alton, Hampshire. Mr. Bate was presented with the cup and his replica by the Mayor of Blackpool at the reception on the Wednesday evening, while the runners-up received their prizes at the Conference Hall.

Behind the bare statement of fact lies a story of near frustration. The competition was planned for the Royal Lytham and St. Annes Course, but the torrential rain on Monday and Tuesday, coming after a week of wet weather ended this. Early Wednesday morning, the Royal Lytham Course presented a sorry picture of lake-like fairways, ponded bunkers and unquestionably "out of play". A quick telephone call to nearby St. Annes Old, elicited the information that nine holes there were in play and the Club secretary very generously accepted our competition. For this we are extremely grateful to the St. Annes Old Club.

The early morning competitors and the "Orderly Corporal" hurried to the Old links and very quickly

*The Baxendale stand at the exhibition, displaying the Fantom and other popular solid fuel fires*

play was got underway. This continued through the morning and after lunch a re-organized field strewed itself out over nine holes which in great good humour it covered twice. The tolerance of Club Members and the patience of competitors was greatly to be admired, but it was well into dusk when the last two made the Club House safely and so by mutilating Gray's Elegy we end the 1967 "S.S.F.F." Saga:

*The curfew tolls the knell of parting day,*
*The purring cars pass quickly by the sea,*
*The last two inward plod their weary way,*
*And leave their scores to darkness and to me.*

*E. J. Winfield*

**Conference Publicity**

The fact that the Blackpool Clean Air Conference 1967 attracted more TV, radio and press publicity than any other meeting of the Society in recent years, is largely the result of the controversial Des Vœux Memorial lecture delivered by Dr. E. M. Schumacher and the violent reactions it subsequently engendered. Sir John Charrington's reference, in an aside, to miners' concessionary coal in his Presidential address also aroused considerable publicity.

*TV and Radio:* Altogether the conference occupied 22 minutes and 55 seconds of broadcasting time, featuring as follows:

*17 October:* Northern News, Radio 4: Sir John Charrington's criticism of miners' concessionary coal.

*18 October:* (1) Northern News, Radio 4: Denial by the Secretary of the Yorkshire Miners' Union; (2) Independent Television (N), "Scene": Criticism by the Lancashire County Planning Officer (U. Aylmer Coates) that towns in the North West are not doing enough about smoke control.

*19 October:* (1) News, Radio 3: Report of Dr. Schumacher's address; (2) "The World at One", Radio 4: Interview with Dr. Schumacher; (3) Independent Television (N), "Scene": Interview with Dr. Schumacher and with Peter Williams of C.E.G.B.; (4) "From the North", Radio 4: Interview with Dr. Schumacher and with Peter Williams.

*20 October:* "New Worlds", Radio 4 (the first in a new B.B.C. series): A programme on air pollution, including an interview with Arnold Marsh referring to the conference.

**Press Publicity**

Ten press stories on the conference and exhibition were prepared well in advance and sent to the local, national and technical press who used the information provided. In particular, the provincial papers like to publish the names of the local representatives who are attending and for this reason a special press release was sent to them.

As a result, 300 press cuttings on the subject of the conference and exhibition had been received up to 10 November and quite a few more are expected to arrive from the technical press and overseas publications. It should be noted that while the International Congress in 1966 resulted in only 10 reports in the national daily papers, the Blackpool conference had 37. The reason was again as mentioned above and also because the proceedings were opened by a Minister.

On the opening day a successful press luncheon took place for the journalists present and for the members of the Conference Committee who acted as hosts. The press facilities provided at the conference hall and the excellent press office were very satisfactory.

## MEETING WITH AMERICAN TOUR GROUP

An Air and Water Pollution Study group of the American Institute of Plant Engineers, after a European tour that took in Holland, Denmark, Sweden, Switzerland, West Germany, ended what must have been an absorbing journey in London. On 2 October twelve members of the group, with three of their ladies, joined members of the British Institution of Plant Engineers and the National Society for Clean Air at an informal—and fraternal—discussion meeting at the Royal Society of Arts.

With the President of the British Institution in the chair, the meeting was briefly addressed, first by Dr. Albert Parker on both air and water pollution, and then by Herb Lund, leader of the tour and editor of the journal *Factory*; followed by Arnold Marsh of the N.S.C.A., and F. E. Ireland, Chief Alkali Inspector, and by D. H. A. Price and D. W. Jobbins from Britain and C. T. Guardio from Philadelphia, on water pollution and trade effluent problems.

### Radio Comment on N.S.C.A. Report

The following extract from the B.B.C. "News at Ten" programme for 22 September last, speaks for itself:

*Announcer:* A warning that exhaust fumes from cars in crowded cities is becoming a health hazard. It was given today by the National Society for Clean Air in a report on air pollution from cars. It says petrol exhausts, not diesel fumes, is the chief worry. Although the British Government is doing nothing to enforce the fitting of exhaust purifiers, the American Government is; and from next January every car in the United States must have a de-polluter. So the British Society of Motor Manufacturers and Trades says export models of British cars will carry a de-polluter, and Treharne Jones asked Mr. Douglas Richards, the Society's Vice-Chairman, whether this would make cars more expensive.

*Mr. Douglas Richards:* Much more expensive. It'll certainly raise the price of them, but then, of course, it will raise the price of everybody else's by roughly the same amount. In fact we might be raised less than some of the others.

*Treharne Jones:* Do you intend to put these alterations on to the cars you sell on the home market at all?

*Mr. Richards:* At this stage, no. For two reasons—one is because there is no real need at this juncture to have exhaust de-pollution—I am distinguishing between carbon monoxide and say, smell or heavy smoke—there is no need for it at this juncture, and we like to work steadily and get the job done properly. And the second reason is, of course, that it isn't a saleable item as such. We'd just have tariff cuts between ourselves and other countries. We don't want them coming in de-polluted and undercutting us unless the public is going to prefer a de-polluted car. I wonder whether it will?

# AIR POLLUTION AND MAN'S ENVIRONMENT

**Pesticides and Pollution. Kenneth Mellanby. pp. 221. Collins, London, 30s.**

**Man and Environment. Robert Arvill. pp. 332. Pelican Original, Penguin Books Ltd., Harmondsworth. 8s. 6d.**

**The Effects of Air Pollution on Plants and Soil. C. C. Webster. Agricultural Research Council. pp. 53. H.M.S.O. 6s. net.**

**The Countryside in 1970: Advisory Committee on Industry and the Countryside.**

**Sub-Group on Damage to the Countryside by Industry, Report. pp. 25. 19, Belgrave Square, London S.W.1.**

THE first of these three publications is one of the attractively produced *New Naturalist* series, and is the 50th volume. The author is well qualified to write a book which surveys pollution of all kinds, and pesticides in particular, as they affect the countryside. He is Director of the Nature Conservancy's Monks Wood Experimental Station, was head of the Entomology department at Rothamsted, and for many years before that did research in medical entomology both in Britain and the tropics.

The title of the book is perhaps a little misleading, and possibly "Pollution including Pesticides" would more clearly indicate its ambit. Dr. Mellanby first discusses, with emphasis of course on the viewpoint of the naturalist and the countryside, four main types of pollution: of the air, of water, by radiation, and of the ocean and shore. All these are pollutions from waste materials in one form or another. The author then goes on to discuss the special form of pollution that is introduced purposely—herbicides, fungicides, and insecticides. Then follows a chapter on pest control by other means and the control of vertebrate pests. Finally, Dr. Mellanby sums up and looks ahead with a chapter headed "The Future—Improvement or Disaster?".

The chapter on air pollution is short but interesting, and special attention is given to aspects of interest to naturalists, such as industrial melanism in moths, and the effects of pollution on lichens, which are so sensitive that they—or their absence—serve almost as air pollution indicators. What, from our own special standpoint, is valuable is that air pollution is brought into line with other forms of pollution that are eroding the environment and which therefore call for a closer alliance between the many movements that are seeking to defend it. For this reason alone the chapters on other forms of pollution, and indeed the whole book, should be of interest to those who are primarily concerned with air pollution.

On pesticides the author is both very knowledgeable and satisfyingly objective. He examines the problems that have arisen with care, and seeks to balance the good against the evil. The various chemicals used in the control of unwanted life, from weeds to fungi, and from insects to molluscs and animals, are systematically described, and their benefits as well as their dangers are evaluated. This approach to a serious and highly controversial subject is far more convincing than the late Rachel Carson's overstatement of the case in *Silent Spring*, valuable though the shock effect of that book might have been.

Robert Arvill's Pelican **Man and Environment,** which is subtitled "Crisis and the Strategy of Choice", is a fascinating work, which has the added advantage of being a paperback and therefore a low price that should ensure a wide readership. Robert Arvill is the pseudonym of "an expert who has had experience both of planning and of nature conservation at the local, governmental and international levels".

To quote again from the cover note: "What will the world look and be like tomorrow? Must the landscape be an extension of today's? More air fouled by noise and poisonous fumes; more water polluted by chemicals and oil slicks; more land crushed under a sprawl of towns, motorways, airports, factories, pylons, open-cast mines? Is man bound to build a steel-and-concrete hell for himself? Or can effective steps be taken now to preserve some of our countryside and sea-shore from technological clutter? . . . to ensure, at any rate for our children, healthy land, clean air, pure water, and adequate space, the book proposes a strategy and a set of standards to enable man to shape his environment according to a worthwhile design?".

The scope of the book is wide, and the problems reviewed include land, leisure activity, air, water, wild life, "Unities", the people in Britain's countryside, population, and planning. Then there come chapters on requirements and proposals, a chapter on international aspects, and one of conclusions.

Some of the subjects, land, air, water, and wild life, are divided into two chapters, one in general terms and one in relation to the problem in Britain. The chapters on air pollution, as in Mellanby's book, are necessarily short, but they make some of the right points. It was pleasing to note the National Society for Clean Air described as "a powerful voluntary body which is working to abolish all forms of air pollution", and which has achieved a great deal in the field of public education.

The chapters on planning, requirements and proposals are important and call for close study. Their theme can best be summarized in the author's own words in his preface: "It proposes that, in future, Government emphasis ought to be laid on conservation philosophy, principles and strategy rather than the detailed, negative, restrictionist planning which at present often bedevils individual freedom and irks so many. It proposes that what is essentially a process of reconciliation should be arranged between competing claims and individuals, between the forces of nature and our power to guide them, between man's baser and his finer capacities."

We respect this book for the outstanding way in which its case is presented, for the way the facts are marshalled and the clarity with which they are expressed. We welcome it too as a further example of the growing recognition of the need to view the environment as a whole. Thanks to its modest price it has a better chance than would otherwise be the case of becoming a best-seller, and we hope that it does.

### Plants and Soil

The Agricultural Research Council has performed a most useful service in the publication of the paper on *The Effects of Air Pollution on Plants and Soil.* This is described as a review of the literature, compiled by C. C. Webster. The literature on this aspect of the air pollution problem is now very extensive, so that it becomes increasingly difficult for all who are not specialists in this field to keep track of the current state of knowledge, and of the more important contributions being made to it. The review will be of service to all working on plant and soil questions into which air pollution factors enter, and it will be of equal value to students of air pollution generally.

The author deals with his voluminous source material by dividing it into the effects caused by the different pollutants—smoke, deposited matter, sulphur dioxide, fluorides, photochemical or oxidant smog, and lead, with briefer references to what is described as "London-type" smog and to plants as indicators of air pollution. There is also a general summary as well as a list of about 200 references.

The summary, in which conclusions are drawn from the preceding detailed surveys, suggests that conditions in this country are in fact improving and in some respects are of much less importance than they were. Smoke (in the air) is no longer regarded as an important problem for agriculture and horticulture, but deposited matter may be so in many parts of Britain, where the deposits "exert some adverse effect by reducing the marketable value of certain crops and by limiting the light available for photosynthesis, but there appears to be virtually no information on the extent of the areas affected or the economic loss suffered".

Sulphur dioxide is given much more attention, and it is pointed out that although there has been a marked increase in emission, ground level concentrations have been declining. It is concluded that fluorides from brickworks have no appreciable effect on plant growth (a view not entirely consonant with those expressed in the Bedfordshire Brickfield Report, to which we make reference elsewhere in this issue). On lead, it is mentioned that preliminary investigations near three main roads in Britain show that, as in America, vegetation is contaminated by lead derived either directly from the exhaust fumes of motor vehicles or from contaminated dust.

From the text and the references it will be seen that only a small part of the knowledge we have on this subject is from research carried out in this country: perhaps because our control measures, operating as they have over many years, have left us with less acute problems than in some other countries. The information that this research provides is nevertheless of importance to us, and the Agricultural Research Council has done an excellent job in making it available in this form.

The fourth publication noted at the head of these reviews is a short (unpriced) report by a committee of the "Countryside in 1970" group, set up after a study conference convened by the Duke of Edinburgh. The report surveys the damage done to the countryside by industry, and to us its extraordinary feature is the absence of any reference to air pollution as a cause of damage. A study of the other three works we have reviewed is therefore respectfully recommended to the members of the committee.

### "Atmospheric Environment"

This is the title of the international journal that has taken the place of "International Journal of Air and Water Pollution". It is published, every other month, by the Pergamon Press, Oxford, at an annual subscription rate of £14 for libraries and other multiple-reader institutions, and £3 10s. for individuals.

The new journal covers air pollution, industrial aerodynamics, micrometeorology, and aerosols. It contains papers and technical notes that are in the main of specialized scientific interest, together with bibliographies and book reviews.

We hope to refer to, or give abstracts of material interest, and one such abstract, from the September, 1967 issue, will be found on page 129. Other papers in this issue include "Atmospheric pollution during spells of low-level air temperature inversion", "Relationship of nitrogen oxides in auto exhaust to eye irritation", and "Lead from auto exhaust on mouse bone lead concentration".

### Climate for Living

This is the title of a 64-page paperback book (Macdonald, London, 5s. net) by Anthony Tucker, who is science correspondent of the *Guardian*.

The book contains much interesting and stimulating information and thinking about the development of new towns, the future of urban living, and the provision and utilization of energy. The basis of the book, and the case throughout is, however, bound to be controversial, as it is based on the concept of the "total electric" town.

*"Air Knows no Frontiers"*

# *INTERNATIONAL SECTION*

*Czechoslovakia*

## AIR POLLUTION TAX LAW

A Czechoslovakian delegation, during a recent visit to Britain, visited the Society's offices for what proved to be a most informative discussion. Grit and dust prevention was the principal interest of the visitors. We were informed of a new air pollution law that embodies a novel form of control. The amount of grit and dust and of sulphur dioxide emission is related to chimney height, and a table included as an appendix to the law states the emissions allowed (in kilograms per hour) for chimneys ranging in height from 7 to 300 metres.

If these emissions are exceeded the undertaking concerned is liable to a tax, the maximum amount of which also increases with chimney height. Thus at one end of the scale, for a chimney of 7 metres, 2·5 kg/h of grit and dust, and 2 kg/h of sulphur dioxide, are allowed, with a tax of 4 koruna (1 k = 5¼d.) for excess. For a chimney of 100 metres, the figures are 400 kg/h, 375 kg/h and 750 k, respectively; and for a 300 metre chimney they are 3,000 and 8,665 kg/h and 6,500 k.

The law was passed only this year, and we understand that it was not yet in operation. We were unable to obtain details on sampling and measurement procedure (there were language difficulties); but it was gathered that the money accruing from the tax would be shared between central research organizations working on air pollution, and the local authority for the improvement of civic amenities. Public health inspectors would be responsible for observations and action.

As we see it, offenders will be faced with a choice between measures to reduce pollution, to heighten chimneys, or to accept the tax.

Emission limits are also tabulated for a number of other pollutants, including both inorganic and organic compounds.

*U.S.A.*

## AUTOMOTIVE POLLUTION REPORT

The U.S.A. Clean Air Act requires an annual report on air pollution from motor vehicles and measures taken for its alleviation to be submitted to Congress by the Secretary of Health, Education, and Welfare. The sixth such report has recently been published. (Senate Document No. 47, U.S. Government Printing Office, Washington, D.C.)

The report states that satisfactory progress is being made in the testing and certification of 1968 model vehicles or engines to determine conformance with regulations under the Clean Air Act. "With few exceptions", it states, "virtually all major manufacturers, known to import or sell cars in the United States, are working diligently to fulfill requirements to limit crankcase emissions and exhaust hydrocarbon and carbon monoxide emissions. This certification programme is being conducted at the Motor Vehicle Compliance Laboratory of the National Centre for Air Pollution Control."

The Laboratory, which is at the Willow Run Airport, Ypsilanti, Michigan, had by May last carried out some 600 certification tests. Details are given of research in progress, both by the National Centre and by private industry, as well as co-operative research.

Electrically driven vehicles are discussed, and the National Centre has undertaken, by contract support, "a study of electrochemical power systems and of thermal, nuclear, and mechanical propulsion systems having pollution-free potential for vehicles".

Atmospheric measurements of "automotive-related gaseous air pollutants" are reported, and a table gives readings for seven major cities. The pollutants examined are oxidants, nitrogen dioxide, nitric oxide, carbon monoxide, and hydrocarbons. Readings are given for the annual mean, 90th percentile (which means the concentration exceeded 10 per cent of the time), and the five minute maximum (the maximum average concentration observed during any five minute period throughout the year). The highest oxidants and nitrogen oxide were recorded at Los Angeles, the highest carbon monoxide at St. Louis and Chicago (68 and 66 p.p.m.) and the highest hydrocarbons at Denver (19·1 p.p.m., 5 min.-max.).

Reference is also made to lead measurements, and, although there are other sources of this, statistics show a "positive and strong correlation between lead levels and gasoline consumption".

### *Effects*

A further section of the report reviews research on "health effects criteria for use as a basis for establishing air quality standards". It is said that there is increasing evidence of damage associated with decreases resistance to bacterial and other infectious and toxic agents. Exposure of animals to artificial smog has produced alterations of pulmonary function such as increased expiratory resistance in guinea pigs, and diminished physical activity, diminished fertility, and increased susceptibility to spontaneous pneumonia. Increased susceptibility to experimental bacterial infection from strepotococci has regularly followed exposure of mice to artificial smog.

Damage done by nitrogen oxide and oxone is also recorded, and of interest are references to work on lung cancer. Benzo(a)pyrene and other carcinogens, although capable of inducing cancers when painted on the backs of mice, have not been found to produce cancers with any regularity when injected into the lungs of experimental animals. However, recent information indicates that when benzo(a)pyrene is incorporated with iron oxide or hematite and injected into the trachea, tumours of the lung, mimicking human lung cancer, can be regularly induced in hamsters. Both of these substances are prevalent in polluted air.

Reference is also made to tests on the effects of carbon monoxide on young non-smoking adults. Ability to discriminate between short periods of time deteriorated after exposures at 50 p.p.m. after 90 minutes, and at proportionately shorter times at higher doses up to 250 p.p.m. Inhalation of gas containing carbon monoxide at sufficient concentration to raise the carboxyhemoglobin level to around 4 per cent caused the development in the non-smokers of an increased oxygen debt with exercise and a reduced pulmonary diffusing capacity at rest.

## OTHER U.S.A. NEWS

### British Cars Approved by California

The Motor Vehicle Pollution Board of the State of California at a meeting on 13 September last approved nine further automotive emission control systems from Jaguar, B.M.C., Triumph, Opel, Rover, Rolls Royce, British Ford, Citroen, and Kaiser Jeep. Since 1961 the Board has approved 21 exhaust control systems and 80 crankcase controls.

The Board came to an end on 8 November, when it was replaced by a newly-created State Air Resources Board. This Board will have jurisdiction over sources of automotive pollution and all stationary pollution sources in the State, with enforcement primarily the responsibility of local government.

Another step taken by the M.V.P.C.B. before its dissolution was towards the protection of workers from carbon monoxide by the adoption of test procedures and criteria for control equipment on fork-lift trucks and other in-plant machinery.

### National Conference Proceedings

We have just received a copy of the *Proceedings* of the Third National Conference on Air Pollution, held in Washington in December last (see reports in this journal, Spring, 1967 issue). The conference was organized by the Department of Health, Education, and Welfare, and the *Proceedings* (Public Health Service Document No. 1649) is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20204, price $4·25.

The volume is a substantial one of 667 pages, quarto size, and is printed in a very readable form. It includes the addresses and reports given in the plenary sessions and in the meeting of the eight panels. These covered motor vehicles, heat and power generation, industrial operations, solid waste disposal, state and interstate control programme, local and regional programme, the role of the federal government, and economic and social aspects. Discussions are included, and there is an index to speakers of about 250 names. There is also a valuable subject index.

It will be seen that the ground is covered very thoroughly. Many of the papers are of high technical and informative quality, and in short the volume is both an excellent text-book on air pollution, and a very illuminating guide to the present situation in the U.S.A., as well as, for the foreigner, a key to the prevailing climate of opinion and attitudes.

### Aerosols

The September issue of the Journal of the Air Pollution Control Association is a special number devoted to papers and reports on the work being done in many quarters in the U.S.A. on research and investigation into aerosols.

### "Factory"

The influential and well-known industrial magazine *Factory*, published by the McGraw-Hill organization, has inaugurated a special monthly section on "Industrial Pollution Control". The section covers water as well as air pollution, and includes both articles and news items related to the two fields, in their industrial aspects. There is also a useful "datebook", or calendar, of forthcoming air pollution events.

### "Fortune"

The July issue of the business magazine *Fortune* included a well-informed and comprehensive article entitled "The Revolt Against the Internal Combustion Engine", by Lawrence Lessing. This is a review of the situation in the mounting campaign against vehicle pollution that has developed so emphatically in the U.S.A. during the last few years. Apart from explaining the action being taken against polluting vehicles, and the reasons for it, the article gives a useful account of the prospects of the electric vehicle with its "zero emission". The article has been reprinted as a pamphlet by the H.E.W. Department of the Public Health Service.

### Environment

We have only just seen, at Vol. 1, No. 8, the journal *Environmental Science and Technology*, an American Chemical Society publication. Environmental factors, including both air and water pollution, are carried in the form of research reports and other communications. Abstracts of two of these are included in our Air Pollution Abstracts on another page. We give top marks to the typography and layout of this journal.

# N.Z. POLLUTION REPORT

The Eighth Annual Report of the Chief Chemical Inspector for the New Zealand Government declares "no one questions that air pollution is a problem; it is subtly affecting everything we buy and do. Yet we are not using the proven principles that could bring about a profound reduction in this pollution".

After this forceful declaration of intention the report goes on to describe the increasing problems affecting a country moving towards greater and more extensive industrialization while still to all appearances devoted to pastoral pursuits, to such an extent that it can be reported "there were no air pollution episodes during the year of any special significance although during April and May there was again considerable complaint in the Auckland area".

In Christchurch the pollution levels in winter were found to be about one-third of the London winter average for smoke and about one-fifth for sulphur dioxide. The worst conditions measured showed pollution to reach levels about one-sixth of those experienced in London fogs of long duration. These figures are not satisfactory when related to the quantity of fuel burned and bearing in mind that the dispersion of pollutants in this the second city of New Zealand are on the average less satisfactory than in London. The report mentions the setting up of a Society for Clean Air in Christchurch and in Auckland an Air Pollution Research Committee, supported by a levy on local authorites. The Australasian Air Pollution Control Association is described as capable of making a valuable contribution to the technical discussion of air pollution problems in the southern hemisphere. The considerably increased public interest in air pollution in New Zealand is attributed not so much to the worsening of conditions in the atmosphere but to the alarming reports from overseas in the widely read popular journals. This is regarded as dangerous because it can divert attention from what is practicable and relevant to the country.

Hopes are expressed that the technical means will be available within five years for the recovery of between 20 per cent and 40 per cent of fuel sulphur, but it is emphasized that this degree of sulphur recovery is unlikely to be economic but will save the country one million N.Z. dollars (£500,000) in overseas funds and make available low sulphur fuels for urban use. For the small fuel user in these areas, low sulphur fuels are the only satisfactory solution to the air pollution problem while the larger operator will need to rely on dispersal from relatively tall chimneys for a long time yet.

Twenty-two officers have completed the course for the Director-General of Health's certificate of competency in administering the technical provisions of the Smoke Regulations and 19 of these sat the examination for the Smoke Inspector's Certificate of the Royal Society of Health. The recession in many industries has had an adverse effect on air pollution progress as control measures are usually the first to be set aside when the market is depressed and the last to receive attention when it revives.

The report gives a full list of Scheduled Processes with, as is to be expected, the largest number of works being devoted to animal products, but with mineral processing a close second. Site work is well in hand for the new major steel industry and an assurance has been given that air pollution control requirements will be given full consideration. The gas industry in New Zealand is described as being on the threshold of the major changes which have happened overseas and concludes with a reference to the lip service paid to the idea of smoke-free, traffic-free cities with little evidence of the sort of constructive planning and provision which can make this a reality. An Appendix lists the local authorities who have adopted the Smoke Restriction Regulations.

*Australia*

## CLEAN AIR DRIVE IN QUEENSLAND

More air pollution experts are to be brought to Brisbane from throughout Australia to assist in the fight against increasing smog, announced the Minister of Health, Mr. Tooth, recently. Under the direction of A. Gilpin, Director of Air Pollution, the expert team being built up would soon take over new premises. Pollution measurements are to be taken throughout the metropolitan area and in all industrial centres.

*Council of Europe*

## DECLARATION OF PRINCIPLES

According to press reports a declaration of principles on air pollution has now been drawn up by 40 government experts meeting at Strasbourg in September last. The Declaration sets out a number of basic principles to guide Governments in shaping policies to prevent or abate air pollution. These cover the three main sources of pollution—industry, domestic, and motor vehicles. The principles define the basis of pollution control regulations, the supervision and enforcement of regulations, the special considerations affecting town and country planning, international aspects of air pollution, etc.

To ensure more effective control the experts further call for increased technical studies and research, not only on the prevention and reduction of pollution but also on the dispersal of pollutants and their effect on man and his environment.

The text of the draft will not be made public until it has been approved by the Committee of Ministers of the Council of Europe.

### Stichting Concawe

The Oil Companies International Study Group for the Conservation of Clean Air and Water, Western Europe (CONCAWE) announces that the organization is now supported by Phillips-Imperial Petroleum Ltd. This means that 15 oil companies, representing about 80 per cent of the crude distillation capacity of Western Europe are now co-operating in this effort.

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### More Vehicle Examiners

A national network of Ministry of Transport vehicle testing stations is being set up to test heavy goods vehicles under the provisions of the Road Safety Act, 1967, and the Ministry is expanding its force of vehicle examiners to man them. Tests will include liability to smoke emission.

### Smoke Control Offences

Three Moreton householders were each fined £10 by Wallasey Magistrates in August for allowing smoke to issue from chimneys in a smoke control area. One defendant told the court he had only been kindling his fire. The house was all-electric and he could not afford to have gas installed for a poker. The others claimed there was some coal in their smokeless fuel.

### New British Standards

Recent issues are B.S.4207 on "Monolithic Linings for Steel Chimneys and Flues", and B.S.1016, Part V., on "Determining the Gross Calorific Value of Coal and Coke".

### Filter Testing Authority

The HEVAC Association—of heating, ventilating, and air conditioning manufacturers—has proposed a filter testing agency to be called the "British Filter Testing Authority". The main object of the proposal is to provide central testing facilities for filter manufacturers using B.S.2831, B.S.3928, and American Filter Institute test methods.

# REPORTS FROM THE FUEL INDUSTRIES

## GAS

**The Gas Council. Annual Report and Accounts for 1966-67. H.M.S.O., 16s. 6d. net.**

Although, as the report says, the results of the exploration for natural gas beneath the North Sea has dominated the forward plans of the industry during the year under review, the continued progress that is here recorded stems from other causes. The growth rate of 9 per cent per annum over each of the past two years means that demand from consumers must be met before large supplies of natural gas become available.

On natural gas itself it is reported that the reserves of gas from the proven and completed wells is approximately 25 million million standard cubic feet. This does not include new discoveries still to be assessed. The significance of these reserves can be judged by the fact that the daily flow rate could be about three times the present daily output of the industry. And there is every likelihood that further gas deposits will be discovered.

The quality of North Sea gas is said to be good, and—of importance to those concerned with clean air—most of the gas is free from sulphur compounds.

The Gas Council has set up a Conversion Executive to facilitate the immense task of converting for use with natural gas the 30 million appliances in use. Plans are being made to make the conversions in a shorter time than originally intended.

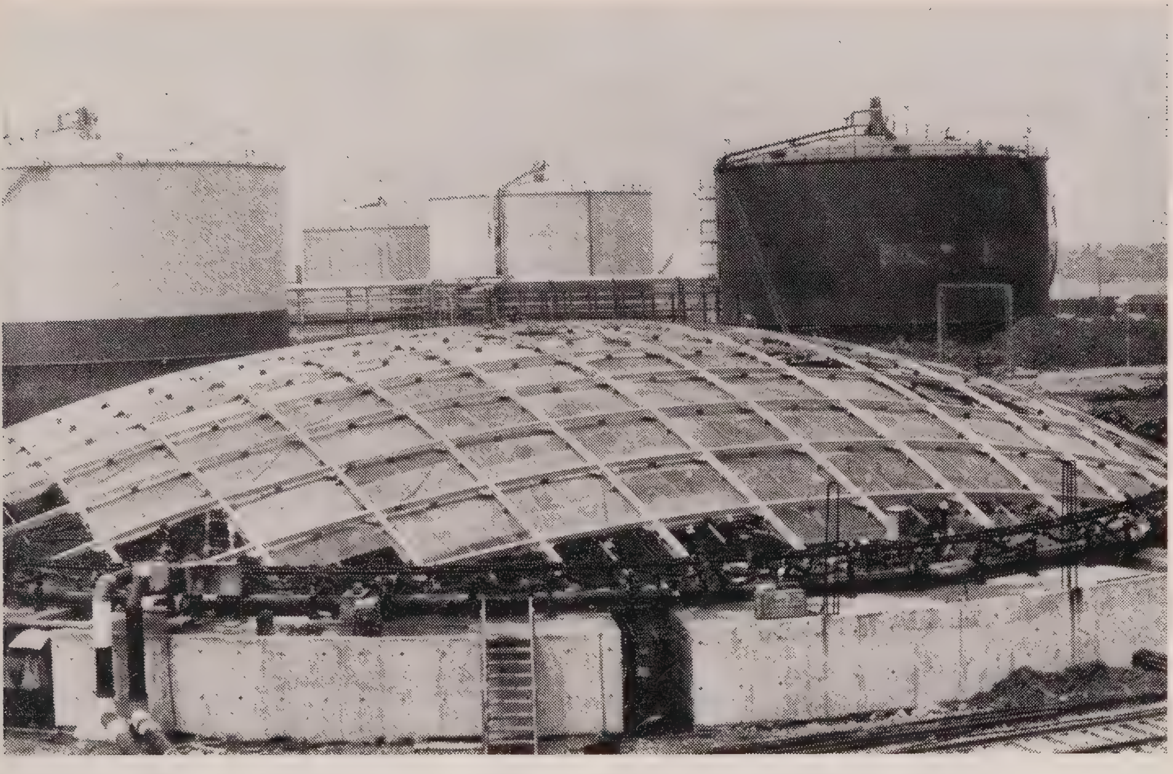
Manufactured gas production increased by 274 million therms (7·1 per cent) compared with the previous year, and reached 4,114 million therms. Only 34·2 per cent of the total is now coal gas and water gas, while the percentage of oil gas produced has risen from 18·0 per cent in 1965-66 to 28 per cent in 1966-67.

### *New Processes*

Further plants employing the Catalytic Rich Gas process, for which the Council received the Queen's Award to Industry, and the Gas Recycle Hydrogenation process have been constructed. Both types of plant are capable of being adapted to produce a natural gas substitute. A new type of Gas Recycle Hydrogenator utilizing a fluidized bed has been devised by the Council whereby crude oil can be used as a feedstock. Since there is a greater security of supply for crude oil itself than for light distillates which are the present feedstock for hydrogenation plant, this development has commanded international attention. Agreement in principle has been reached with the Osaka Gas Company Ltd. of Japan on the construction of a semi-commercial scale development plant using this process. Another of the Council's developments arising from research in the laboratories of the North Western Board, and which has commanded considerable interest from many parts of the world, is the use of catalysts containing uranium for gas production.

### Coke and Clean Air

The production and sale of coke has declined further with the decrease in the amount of coal carbonized, and also because of the mild winter. Including the industry's premium fuels, the quantity sold was 5·87 million



*One of the four in-ground gas storage "freeze" tanks under construction at the Canvey Island terminal*

tons, compared with 6·74 the previous year. The sale of the premium fuels decreased by about 10 per cent.

On clean air the report has three succinct lines: "Supplies of the industry's solid smokeless fuels were still available in sufficient quantity for existing smoke control areas. As the industry's output of solid fuel further declines in the future an increasing onus will be placed on gas as the fuel for smokeless zones."

From the clear air viewpoint especial interest is attached to the sale of gas heating appliances, many of which are installed in smoke control areas being established. The change in recent years is well shown by the following figures:

| *Appliances Sold* | 1960-61 | 1966-67 |
|---|---|---|
| Space heaters | 265,538 | 852,550 |
| Warm air heaters | 8,000 | 88,000 |
| Central heating boilers | 18,000 | 143,000 |

On finance, the aggregate net surplus of the industry was £3·9 million, compared with £11·1 million in 1965-66. Each of the Area Boards made a surplus with the exception of Wales and South East.

The report includes an important chapter on research, on which £2¼ million was spent during the year. This covers basic research, gas production, purification, storage, transmission and distribution, industrial utilization, and domestic and commercial utilization and development.

# COAL

**National Coal Board: Report and Accounts, 1966-67. H.M.S.O. Report, 6s. net. Accounts, 19s. net.**

In 1966-67, the Board reports, further progress was made in reshaping the British coal industry. By March, 1967, productivity had reached a record 38·9 cwt. a manshift—4 per cent higher than in March, 1966. Over the year as a whole, compared with the previous year, the increase in productivity was 1·4 per cent. The increase was concentrated in the latter months of the year and was associated with marked increases in output and profitability. This advance, together with the continuing effects of the capital reconstruction begun in 1965-66 and the price increases made in the spring of 1966, led to a surplus of £0·3 million on the Board's accounts, after payment of interest.

The Board's collieries produced 164·6 million tons of coal during the year, 9·5 million less than the previous year. The mild winter and slackening in economic activity contributed of course to the fall.

For this journal the paragraphs on solid fuel in the home are of especial importance. Domestic consumers used rather less solid fuel during 1966-67 than in the previous year, but although sales of house coal by merchants fell by 1·7 million to 19·3 million tons, the sales of the Board's naturally smokeless and manufactured fuels increased from 2·6 to 2·8 million tons. At the end of the year the Board's smokeless fuels accounted for 12·4 per cent of all domestic sales.

The report continues: "The greater use of smokeless fuels is closely linked with the growth of central heating installations as well as with the extension of smoke control areas. Despite intense competition, a very large number of new central heating systems using solid fuel were installed during the year. The most popular type of new solid fuel installation is the roomheater with a high-output back boiler; this system combines many of the attractions of the open fire with the comfort of full or partial central heating and constant hot water, at an economical price." During the year, loans totalling nearly £12 million were advanced under the Board's Housewarming Plan, reflecting the sustained demand for better standards of home heating.

*From the NCB report: the Killoch Colliery, Ayrshire, showing the administrative block and one of the winder towers*

### The New Fuels

Referring to the new char briquetted fuels, "Homefire" and "Roomheat", it is reported that they were not available in quantity at the end of the year. "The Board had hoped that appreciable quantities of these efficient and attractive fuels would be on the market by the winter of 1966-67, but difficulties in commissioning the "Homefire" plant at Coventry and the prototype Roomheat plant at Markham Main were not fully overcome. The processes for the manufacture of these fuels are complex, and their first full-scale application raised a number of engineering problems. During the year, the Board decided to concentrate greater engineering and scientific resources on working towards the solution of these problems and in January, 1967, they set up at Nuneaton the Char Briquetting Group of Coal Products Division for this purpose. By the end of the year, encouraging progress was being made and Homefire of commercial qualities was in production on a limited scale. Much further work will be required to attain regular production but the Board are taking all possible measures to achieve this objective."

On the other hand, production of "Multiheat", the new smokeless fuel for boilers, roomheaters and modern open fires, increased steadily during the year as commissioning problems at the Cardiff plant were overcome. Good progress was made during the year with an extension to the present plant, designed to increase production of Multiheat to 330,000 tons a year by the winter of 1967-68. During the year under review the production of Phurnacite, well-known and popular for many years, was 809,000 tons.

### District Heating

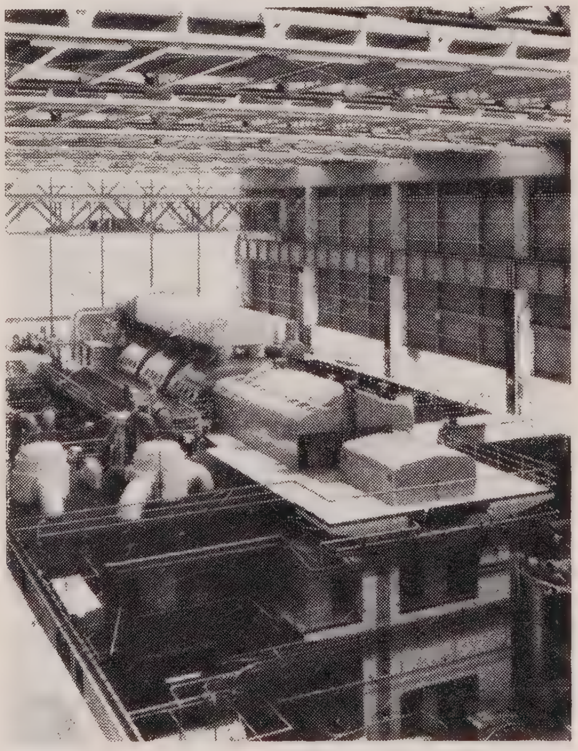
Another paragraph refers to the Board's interest in district heating, and records that six new schemes came into force during the year.

To meet the growing demand for district heating schemes, the Board, in association with Solar Industries Ltd., and the Compagnie Générale de Chauffe, formed a joint Company, Associated Heat Services, Ltd. The company offers a comprehensive heat service to developers and local authorities, including the financing, design, installation, and maintenance of boiler houses, boiler plant, and distribution services for district heating schemes.

# ELECTRICITY

**The Electricity Council: Annual Report and Accounts, 1966-67. H.M.S.O., 16s. net. The Central Electricity Generating Board: Annual Report and Accounts, 1966-67. H.M.S.O., 10s. 6d. net.**

The total income of the electricity industry amounted to £1,141 million (against £1,094 million for the previous year). Income from sales of electricity rose by 4·6 per cent in total, from industry being 5·0 per cent more, from domestic consumers 3·3 per cent and commercial consumers 6·8 per cent more.



*One of the first 500 MW turbo generators at West Burton power station. On order are 50 of these machines, each of which has a greater output than many existing power stations*

The expenditure on revenue account amounted to £1,120·8 million (against £1,009·3 million) leaving a balance of revenue of £20·6 million used wholly to finance capital requirements. Gross return on capital net assets amounted to 10·9 per cent (against 12·6 per cent in the previous year).

The reduction in the rate of increase of sales reflected the Government's measures of economic retrenchment. In addition the mild weather in the first quarter of 1967 and an increase of about 10s. per ton in the cost of coal adversely affected the revenues. In contrast the expenditure was influenced by the fact that the investment programme related to an economic rate of growth that was not attained. In order to achieve the agreed 12·4 per cent return on capital assets it may be necessary to increase tariffs.

Sales of electricity to all consumers amounted to 141,479 million units (2·3 per cent more) of which 61,378 million units went to industry (1·2 per cent more) 52,085 million units to domestic consumers (2·5 per cent more) 20,004 million units to commercial users (5·2 per cent more). Of the above 6,675 million units were sold on off-peak tariffs (26 per cent increase over 1965-66), divided as follows: 425 million units to industry (5·8 per cent more); 3,949 million units to domestic users (38·5 per cent more); 1,984 million units to commercial users (13·1 per cent more).

The number of consumers at 31 March 1967 amounted to 17,544,935 (1·6 per cent more) and the average price per unit to consumers was 1·775d. (1·737d. in 1965-66).

Capital requirements during the year amounted to £616·4 million (against £594·5 million in 1965-66). Internal resources provided £237·1 million (38·5 per cent against 46·6 per cent in 1965-66).

At 31 March 1967 the total output capacity of Generating Board power stations amounted to 38,468 MW an increase of 1,563 MW during the year (2,546 MW in 1965-66).

1,262 circuit miles were added to the Central Electricity Board's transmission lines and 7,638 miles to the Area Board's mains. Greater transmission capacity is being obtained by increasing the voltage of existing lines from 275 kV to 400 kV and by installing new 400 kV lines.

Sales by Area Boards of storage radiators using off-peak electricity totalled 326,716 an increase of 55·9 per cent and it is estimated that some 133,000 were sold by other distributors. At the end of March 1967 it is estimated that the total off-peak load amounted to 6,115 MW.

Considerable advance has been made in standardizing voltage. At March 1949 there were in England and Wales no fewer than 2,078,000 consumers on a.c. systems below the 230-250 volt range and 711,000 consumers on low voltage d.c. systems. At 31 March 1967 there remained some 400,000 consumers on a.c. systems outside the 230-250 volt range and less than 1,000 consumers on d.c. systems. Five Area Boards have completed standardization.

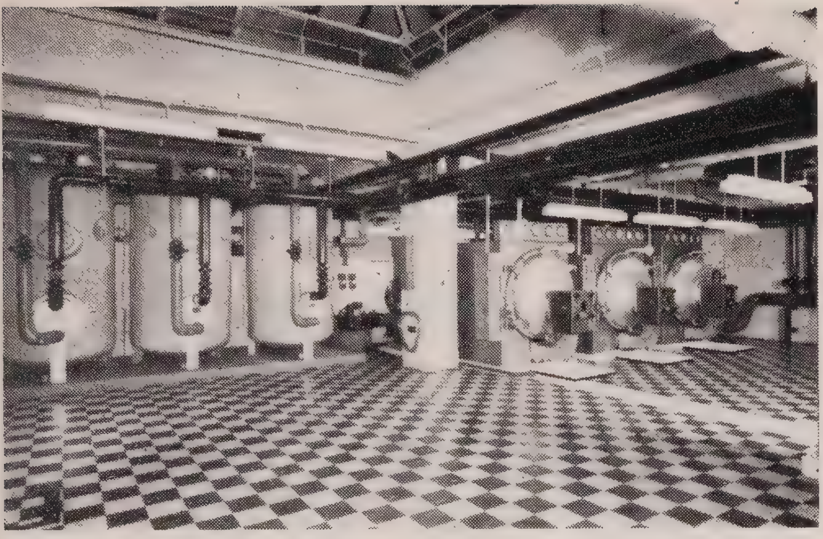
**Generation**

The maximum output capacity of the 226 power stations of the G.E.C.B. in 38,468 MW from which 152,772 million kWh were supplied during the year. The maximum demand amounted to 33,973 MW on 9 January 1967. The system load factor was 52 per cent.

The coal consumed was 61·8 million tons and heavy oil fuel 4·8 million tons. Average delivered price of coal was 93s. 2d. per ton. The average thermal efficiency of the coal and oil-fired stations was 27·53 per cent, adversely affected by the seaman's strike. The highest individual station thermal efficiency was 35·27 per cent achieved on units 1 and 2 at West Thurrock.

Technical developments already in hand will lead to greater efficiency in generation. Forty-seven single shaft 500 MW sets are already on order and it has been decided to order 660 MW sets to be in service in the early 1970's.

In the nuclear field the later Magnox stations which should be completed by 1970 will be competitive with coal for the supply of base-load electricity. The



*From the NIFES report. The new boiler plant at Electra House, London, showing the packaged boilers and the hot water storage calorifiers*

first advanced Gas Cooler Reactor stations are expected to have generating costs below that of contemporary coal-fired stations. Natural gas may provide an alternative fuel for firing power stations in the warmer months when gas consumption is at its lowest.

New generating plant programme provides for an additional 2,920 MW to be available in 1971.

The Board's export to France by the cross-channel link amounted to 72 million kWh and the imports from France amounted to 431 million kWh. 449 million kWh were exported from England to Scotland and 142 million kWh from Scotland to England.

*A.J.C.*

# N.I.F.E.S.

**National Industrial Fuel Efficiency Service: Report and Accounts for the year ended 31 March 1967. N.I.F.E.S., 71 Grosvenor Street, London, W.1.**

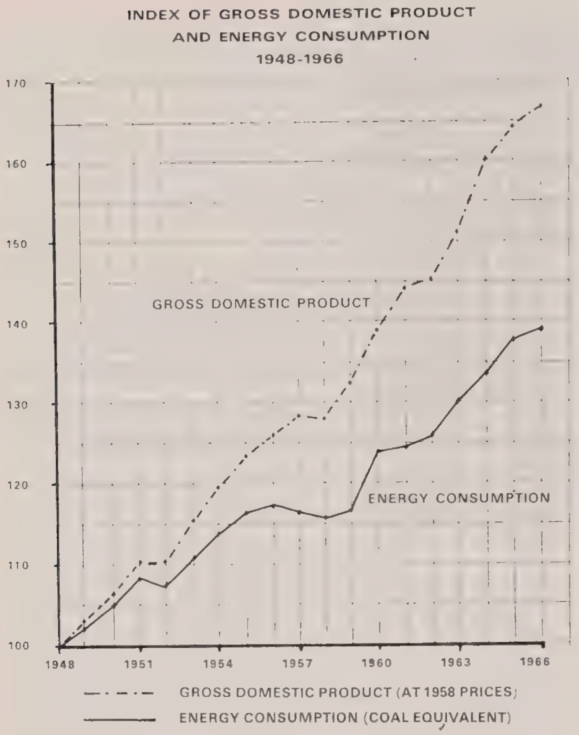
N.I.F.E.S. has now been in operation for thirteen years, and the new report shows that the demand and need for its services continue undiminished. Over 24,000 man-days were spent on fee-earning work by the 164 engineers on the staff during the year. The organization continues to receive support from the national fuel industries—coal, gas, electricity, and oil—but the sum now received (£171,204) is only a fraction of the fees now earned (£426,662).

One of the most interesting sections of the report is on the energy outlook for Britain, and we reproduce a diagram from the report showing the gross domestic product and energy consumption. The notable advance in fuel efficiency that this represents is emphasized in the report by a quotation by the National Institute of Economic and Social Research in its *Economic Review* for May, 1967:

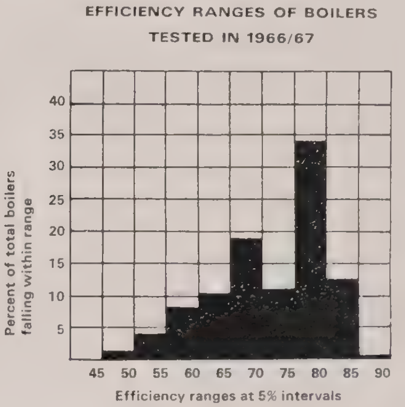
> "If energy consumption had risen in line with national output from 1959 to 1965, it would have increased by 9·7 million tons a year (measured in terms of coal equivalent). It actually rose by 7·5 million tons a year."

The *Review* also showed that "energy consumption, if it had risen at the same rate as the Gross Domestic Product between 1959 and 1965, would have been over 13 million tons higher in 1965 than it actually was. Taking the longer period of 1948 to 1966, if energy consumption had risen at the same rate as the Gross National Product, consumption in 1966 would have been 60 million tons, or 20 per cent greater than the 297 million tons actually consumed in that year."

The implications of this from the clean air viewpoint are obvious. If there had not been this striking saving in fuel there would have been a proportional increase in air pollution, in smoke, grit and dust, and in sulphur dioxide. The success of the



*Diagrams from the NIFES report. That on the left shows graphically how production is increasing faster than energy consumption*



Clean Air Act in the industrial field has been greatly aided by the drive for fuel efficiency, in which the work of N.I.F.E.S. has been outstanding. And, it might be added, the need to conform with the provisions of the Act has reciprocally aided fuel efficiency.

It is interesting also to note the results of efficiency tests carried out by N.I.F.E.S. on several types of industrial boiler. In 1957 and 1958, the mean efficiency of 1,183 coal-fired boilers amounted to 63 per cent. The latest findings for coal-fired boilers showed that the figure is 68·1 per cent, or 5·1 per cent above the 1957-58 figure.

On average, the oil-fired boilers tested in 1957 were 5 per cent more efficient than the coal-fired ones. On this assumption, their mean efficiency was 68 per cent. The mean efficiency of the oil-fired boilers recently examined is 73·8 per cent, or 5·8 per cent above the 1957 figure.

How boilers vary in their efficiencies is shown by the accompanying figure, reproduced from the report. It shows how much more room there is for improvement.

As usual, a part of the report is devoted to case histories, covering boiler plant, space-heating, public authorities, metallurgical treatment, and process plant. Among these cases may be mentioned the results of an investigation on fuel costs in various schools in the East Midlands. "In these cases results were achieved by exercising adequate control over all aspects of combustion and heat utilization, by paying particular attention to the programming and functioning of automatic control systems, and by selecting the most economic fuel." The result was that heating costs were reduced by 33 per cent over a period of three years.

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## The Government Chemist

The report of the Government Chemist for 1966 (pp. 182, H.M.S.O., 15s. net) reveals a vast amount of work, over widely differing fields, carried out by this department of the Ministry of Technology. The staff numbers 426, and gross annual expenditure was £950,000.

Of particular interest to many readers of this journal will be the section devoted to pesticides and toxic gases. It contains much valuable information, and what are probably the latest and most reliable statistics available on pesticide residues in food, in wildlife, rainwater, and the air. The toxic gases principally discussed are hydrogen fluoride and ozone.

**Better things are electric**

*Issued by the Electricity Council, England & Wales*

# Estimates of Air Pollution in Great Britain in 1966

*Tables prepared by Dr. Albert Parker, C.B.E.*

Note: These estimates are normally included only in the Clean Air Year Book, but as it will be several months before the 1968-69 edition is published, earlier publication here appeared to be advantageous. They will be reprinted in the Year Book.

## (1) From the Main Uses of Fuel

Figures in millions of tons to the nearest 0·1m. tons for quantities of fuel, and of grit and dust, and to the nearest 0·01m. tons for smoke and sulphur dioxide.

| *Fuel and Class of Consumer* | *Quantity of Fuel* | *Pollutants Discharged* | | |
|---|---|---|---|---|
| | | *Smoke* | *Grit and Dust* | *Sulphur Dioxide* |
| *Coal* | | | | |
| Domestic (including miners' coal) | 25·5 | 0·83 | 0·1 | 0·65 |
| Electricity works .. .. .. | 67·9 | small | 0·3 | 2·02 |
| Railways .. .. .. .. | 1·7 | 0·03 | small | 0·05 |
| Industrial and miscellaneous .. | 36·0 | 0·11 | 0·2(*a*) | 1·04 |
| Coke ovens .. .. .. | 24·3 | small | small | 0·09 |
| Gas works .. .. .. | 16·7 | small | small | 0·12 |
| | 172·1 | | | |
| *Coke* (excluding consumption in gas works and blast furnaces) | | | | |
| Domestic, including other manufactured solid smokeless fuels .. | 6·4 | nil | small | 0·14 |
| Industrial and miscellaneous .. | 6·2 | nil | small | 0·15 |
| | — | 0·97 | 0·6 | 4·26 |
| *Oil* | | | | |
| Domestic | | | | |
| Kerosene and domestic fuel oils | 2·2 | very small | nil | 0·01 |
| Industrial | | | | |
| Kerosene, gas/diesel and fuel oils, and creosote-pitch .. | 39·4(*b*) | small | nil | 1·89 |
| Road and Rail Transport | | | | |
| Motor spirit, gas/diesel and fuel oils .. .. .. .. | 16·3 | small | nil | 0·08 |
| Marine Craft | | | | |
| Gas/diesel and fuel oils .. | 1·1 | small | nil | 0·04 |
| | 59·0(*c*) | small | nil | 2·02 |
| Total for coal and oil .. .. | — | 0·97 | 0·6 | 6·28 |

(*a*) Excluding grit and dust emission estimated at about 0·4m. tons from industrial processes other than steam raising.

(*b*) The amount of 39·4m. tons of oil is equivalent in heating value to about 67m. tons of coal, which if used for the same purposes would have produced about 0·2m. tons of smoke, 0·2m. tons of grit and dust, and about 1·9m. tons of sulphur dioxide.

(*c*) The amount of 59·0m. tons of oil is equivalent to about 100m. tons of coal, so that the coal equivalent of the coal and oil consumed (excluding air transport) in Great Britain in 1966 was about 272m. tons. In addition there were used nuclear electricity, hydro-electricity, and natural gas together equivalent to about 11m. tons of coal.

## (2) From Road Vehicles

| | |
|---|---|
| Consumption of Motor Spirit | 11·322m. tons |
| Consumption of Derv Fuel | 4·041m. tons |

| *Pollutant* | *Quantity in Million Tons from* | |
|---|---|---|
| | *Petrol Engines* | *Diesel Engines* |
| Carbon monoxide | 5·3 | 0·08 |
| Hydrocarbons | 0·26 | 0·016 |
| Aldehydes | 0·01 | 0·003 |
| Oxides of nitrogen | 0·18 | 0·05 |
| Sulphur dioxide | 0·02 | 0·03 |

The estimated quantity of carbon monoxide discharged into the air from the other industrial and domestic uses of all fuels in 1966 is about 11 million tons of which nearly 5 million tons was from domestic heating appliances.

# *Warren Spring Open Days*

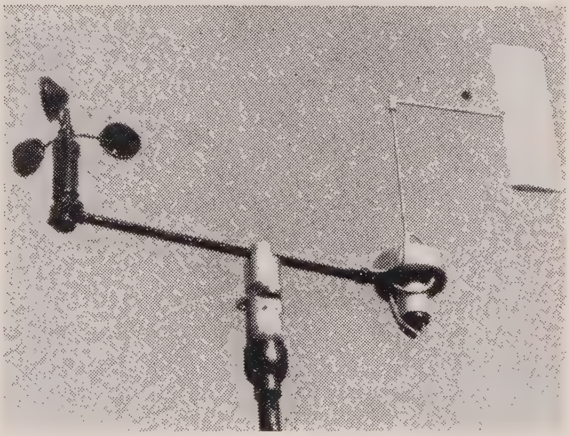
The Press preview preceding the 1967 Open Days at Warren Spring Laboratory took place on 2 October when as usual, the representatives of the press were most hospitably received by the Director Dr. C. C. Hall and his staff.

The exhibits of the Air Pollution Division were located together in a separate marquee, where each research subject had its own display stand with a knowledgeable expert in attendance.

The Laboratory's programme in the field of air pollution consists of:

1. A national survey to determine the seriousness and extent of the problem throughout the country.
2. A study of methods of preventing the emission of pollutants.
3. A study of the way in which pollutants are dispersed in the atmosphere.

*Laser Radar:* A new exhibit shown for the first time to the public, was a high-power ruby laser which is going to be used to study inversion heights and the vertical diffusion of pollution. A very short light pulse is sent upwards through the atmosphere. Any small particles present in its path will scatter the light. The vertical distribution of the aerosol content can be deduced from the scattered light received at the ground level.



*This instrument shown at the Warren Spring Open Days, provides for directional sampling of air pollution from a maximum of four different sectors of the compass. This is controlled by a wind vane; an anemometer controls a separate sampling line for periods when the wind speed falls below 5 m.p.h. The anemometer and wind vane not only control sampling but are connected to a data-logging system so that a permanent record is obtained of the wind speed and direction.*

*Movement of a light wind vane into one of the previously demarcated sectors causes the appropriate sampling unit to come into operation; when a change in wind direction brings the vane round to another sector, the incoming air is drawn through another sampling line. Each sampling line consists of a standard smoke filter and sulphur dioxide bubbler with gas meter and suction pump as used in the U.K. National Survey of Air Pollution.*

*Air Pollution from Motor Traffic:* The Laboratory is making measurements of carbon monoxide in streets of a number of cities throughout Great Britain at the request of the Ministry of Transport with the co-operation of the local authorities and other organizations. It is well known that under favourable conditions (e.g. in congested traffic in narrow streets with high buildings on each side, or in road tunnels), carbon monoxide may occasionally accumulate to such a degree as to cause concern regarding its effect on health, on alertness and on accuracy of driving. In the opinion of the Laboratory, abatement measures cannot be enacted until the extent of the danger has been defined. The present measurements are intended to give this information.

*Pollution in the Countryside:* The countryside outside towns is generally far less polluted, but not pollution-free. Apart from the contribution of nearby small villages there is a measurable amount of contamination of country air from built-up and industrial areas, especially under certain weather conditions. Variation in the concentration of smoke and sulphur dioxide with the distance downwind of a town has been measured using directional samplers which differentiate between air from the town and that blowing from other directions.

*National Survey:* The national survey of smoke and sulphur dioxide is unique in that nowhere else in the world are so many observations of air pollution concentrations made in such a wide variety of communities. The results show how pollution by smoke is at its worst in areas of old-fashioned high-density housing, and decreases to tolerable concentrations in low-density modern housing on the periphery of a town. They also show how the position is very much worse in the north where so much more coal is burnt per head of population. The pattern of distribution of pollution throughout the various types of district of a town have enabled valuable conclusions to be drawn on how new towns can be planned and parts of old ones reconstructed so as to minimize air pollution.

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### S.S.F.F. Report

The Solid Smokeless Fuels Federation's Annual Report for 1966, just published, states that 312 Smoke Control Orders were confirmed during the year for 160 local authorities, covering 470,000 premises throughout the country—the highest figures since 1962. 151 areas previously confirmed, became operative, and of these the Federation visited 92 with exhibitions and other equipment. In all, 192 weeks of exhibitions were arranged and completed in co-operation with local authorities in England, Scotland and Wales. In addition the Federation distributed over 200,000 information booklets to local authorities and the general public.

The Federation held conferences to advise local authorities on fuel availability and appliance selection, and were able to offer advice to over 80,000 householders who were to live in Smoke Control Areas.

Members of the Federation, includes The Gas Council, National Coal Board and British Iron and Steel Federation, as well as the independent producers of solid smokeless fuels and the distributive trades.

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### I.C. Pollution Lectures

In view of possible legislation against vehicle engine emissions, the Borough Polytechnic is arranging a course of five lectures to discuss the causes, effects, and prevention of pollution from internal combustion engines. There will be two lectures by Dr. G. A. Karim on "The Chemistry of Combustion in the I.C. Engine"; one on "The Pollution Problem—Effect on People and Environment", by Alan Mister (of the N.S.C.A.); one on "Measurement of Constituents in Exhaust Gases", by J. B. Cassell; and finally on "Prevention of Pollution", by R. A. Wilson-Jones. The weekly lectures begin on 19 January, the fee being 35s. Details from the Secretary, Borough Polytechnic, Borough Road, London, S.E.1.

# News from the Divisions

## NORTH WEST

Divisional Council meetings were held on 10 October at the Home Heating Centre of Shell-Mex & B.P. Ltd., Manchester, and on 25 October at the factory of Stoves Ltd., Rainhill, Nr. Liverpool. At the latter meeting, members were able to inspect the factory, which is engaged in the manufacture of gas-burning appliances. This was followed by lunch, after which Dr. Culshaw of Stoves Ltd., spoke on "the merits of gas and the future of North Sea gas". In the course of his address, Dr. Culshaw gave the reasons why bituminous coal had been rejected for space heating the factory and referred to their town gas usage of $6\frac{1}{4}$ million cubic feet during the winter, the sulphur content of which caused the discharge into the atmosphere of only 50lb. of sulphur dioxide per day. Should his organization replace this traditional town gas with gas oil, the quantity of sulphur dioxide would rise to about 400lb. per day, due to the fact that this fuel had a sulphur content of about 0·8 per cent. If cheaper heavy fuel oil were used, with its sulphur content of roughly 3 per cent, the discharge would rise to about 1,400lb. per day.

The only alternative would be to go all electric and use power generated at an oil burning power station. This alternative would necessitate the production of $1\frac{1}{2}$ tons of sulphur per day to give the 5,000 therms required. After Dr. Schumacher's remarks at Blackpool the previous week, he felt he should not mention nuclear power! Dr. Culshaw went on to describe the advantages of natural gas and the problems of effecting a changeover to this fuel. The complexities of appliance conversion were explained and the basic economics of such activities—the cost on the national level would be in the order of £400 million, assuming that there are something like 30 million gas appliances scattered about Britain. Dr. Culshaw concluded his address by stressing the advantages of gas to ensure that the air we breathe would consist of oxygen and nitrogen and not a mixture of smoke and sulphur dioxide.

## NORTH EAST

A meeting of the Divisional Council was held in the Washington Suite of the Five Bridges Hotel, Gateshead, on Thursday, 5 October, when members were the guests of the Industrial Markets Division of Shell-Mex & B.P. Ltd. The Division's hosts provided an Exhibition devoted to the detection and measurement of stack solids and emissions and an address was given by D. Barber on the related problems. The Exhibition included smoke pumps, carbon determination apparatus, stack solids apparatus, an oxy fuel burner, a section of an insulated mild steel chimney with story-boards and literature covering the memoranda on grit and dust and chimney heights. Excellent photographs and a film entitled "The Under Water Search" dealing with off-shore drilling of oil and gas were viewed by members.

## YORKSHIRE

On Friday, 6 October, members of the Division met at the Parkway Hotel, Otley Road, Leeds, and after morning coffee confronted a full agenda which included a discussion on the Ministry of Housing's decision to appoint a Working Party to study methods of refuse disposal. At the conclusion of the business meeting, the Division were the guests of Shell-Mex & B.P. Ltd., for luncheon, after which members viewed an Exhibition staged by their hosts on the detection and assessment of stack solids and chimney emissions. The Exhibition and subsequent programme were similar to the gathering at Gateshead described above.

## EAST MIDLANDS

On 7 September members of the Division met at the works of Coalite and Chemical Products, Ltd., Bolsover, at the invitation of the Company. Owing to the large attendance—78 members being present—and to enable everyone to see the processes carried out in the works, the party was divided, one party visiting the Coalite production section and the other the refinery. Small parties followed the the process of low temperature carbonization in four hourly cycles in the 23 batteries each holding 6½ cwts. of coal. The improvements effected in recent years in the prevention of the escape of pollutants during the charging and discharging of the retorts and during the quenching and conveyance of the finished Coalite, reflects considerable credit on the Company. A total of 1,700 tons of coal are carbonized daily at the plant in the production of 1,200 tons of Coalite and many other chemical by-products. At the end of the morning tour the members were conveyed by bus to Chesterfield and entertained to lunch at the Station Hotel by kind invitation of the Directors. The guests were welcomed by A. Goodsell and N. Flack, Joint Managing Directors, and R. Pane, Sales Manager, Coalite Division.

Mr. Goodsell conveyed apologies from Mr. F. L. Waring, the Deputy Chairman and Managing Director of the Company, unavoidably absent due to a business trip to the United States and Canada. He then went on to describe the Coalite Company's close association with the National Society for Clean Air from its early years, and quite apart from the contribution it had made and could make as one of the principal producers of smokeless fuel in the reduction of atmospheric pollution, the Company was in complete agreement with the aims and objects of the Society and appreciated any opportunity to help in the furtherance of its objects. Mr. Goodsell said although the Clean Air Act had certainly motivated progress towards clean air, only 40 per cent of the 8,000,000 premises in the Black Areas were under smoke control, and at this rate of progress it would take another 15 years before all the Black Areas were under control.

Speaking of Coalite Company's contribution to clean air. Mr, Goodsell stated that since 1963 the production at their Askern Works had doubled and a complete new plant had been commissioned at Grimesthorpe, with the result that at the three plants now in operation, production had increased by 110 per cent since 1963, well in advance of the target date. The Company were now the country's largest producers of reactive solid smokeless fuel. During this period increasing production had not been the sole aim of the Company for they had spent £100,000 in improving the works, reducing pollution, thus making a practical contribution to the aims of the Society.

Councillor F. Brothwell, Chairman of the Bolsover Urban District Council and Deputy Chairman of the East Midlands Division, welcomed members on behalf of his Council and paid tribute to the Coalite Company, not only as good neighbours and the largest ratepayers to his Council, but also to the contribution they were making nationally to the cause of clean air. A short business meeting was held at the Station Hotel before returning to the Coalite Works for the afternoon visit where, in the Lecture Room, members were told of the treatment of the products given off in the carbonization of the coals and of the extraction of valuable chemicals by fractionation and distillation until chemical substances as diverse as pitch and vitamin E are evolved. A study of the excellent Products Flow Chart produced by the

Company and issued to the guests, showed the colossal waste which results from the uncontrolled burning of raw coal as a fuel. This was further emphasized by the display in the Exhibition Room of basic chemicals and manufactured compounds recovered as by-products in the production of Coalite. At the conclusion of the tour members were entertained to tea in the Company's canteen. The thanks of the meeting were expressed by G. A. Hiller to the Directors of Coalite and Chemical Products Ltd., for a most interesting and instructive day and for their generous hospitality, to the guides who conducted the parties for their lucid explanation of the plant and processes carried on, to Roger Pane, the Coalite Sales Manager, and John Walton, the Public Health Inspector of Bolsover, for making such excellent arrangements for this successful meeting.

## SOUTH EAST

The Division is planning a one-day conference at Slough College on "Clean Air—Shaping Public Opinion" in 1968. The conference will be open to all members and representatives in the Division and it is hoped to make it as widely known as possible.

The Divisional Council met in Caxton Hall on Thursday, 5 October. The full agenda included a detailed review of the activities of the Division with a view to ascertaining how its effectiveness could be increased. It was decided that greater efforts were needed to bring to the notice of the public (particularly in districts where progress was slow) the benefits of smoke control. An attacking policy should be evolved by the Society on this matter. In addition the exchange of ideas and information between Divisions, at present very scanty, should be improved. The inclusion of a business meeting of Divisional Chairmen and Secretaries in the proceedings of the annual conference was one method suggested.

Lastly, better efforts could be made to increase membership of the Society, particularly amongst those industrial firms actively engaged in making and/ or selling equipment used in smoke control.

The Annual General Meeting was held at the Royal Commonwealth Society on Thursday, 30 November. At the conclusion of the business Dr. P. J. Lawther spoke on Research into Medical Aspects of Air Pollution.

## SOUTH WEST

A short meeting of the Divisional Council was held at 14 September at the Lecture Theatre, Bristol University, to discuss the Annual General Meeting which followed. Officers were appointed for the ensuing year, Chairman, Councillor W. H. England; Deputy Chairman, Captain D. O. C. Maggs; Honorary Secretary, G. J. Creech, M.B.E.; Assistant Honorary Secretary, Graham W. Dhenin; Treasurer, City Treasurer of Bristol. Following the conclusion of the business J. deKeyzer, A.M.I.F., Fuels Development Engineer, Shell-Mex & B.P., gave a talk on "Measurement of Stack Solids from Chimneys". An exhibition illustrated the talk.

A Clean Air Exhibition was held in Lewis's Store, Bristol, for the week beginning 14 September. Opened by the Lord Mayor of Bristol and supported by Dr. A. Parker, C.B.E., the exhibition aroused considerable interest in the city throughout the week.

## SOUTH WALES & MONMOUTHSHIRE

The Annual General Meeting of the South Wales and Monmouthshire Division was held at Port Talbot on 3 November. Alderman Bence, of Cardiff, who has been ill and has retired from the Cardiff City Council, was unable to accept re-nomination as Chairman of the Division, and it was agreed that a letter of thanks for his services and of good wishes be sent to him.

The new Chairman elected at the meeting is Alderman Mrs. P. Mainwaring, J.P., Mayor of Port Talbot.

Mrs. Mainwaring is also a member of the Clean Air Council. Alderman Bevan, of Swansea, was re-elected as Deputy Chairman, and Lindsay Morgan, of Port Talbot, as Hon. Secretary.

The meeting was well attended, with about 50 members and delegates present, and in the absence of the Mayor a civic welcome was extended by the Chairman of the Port Talbot Public Health Committee, Alderman J. Warren. The Deputy Chairman presided. A programme of meetings and visits for 1968 was discussed, and it was evident that after a period of some difficulty the Division was eager for renewed activity. The Society's Director, Arnold Marsh, was present and was welcomed. He spoke briefly of his pleasure in finding the Division so enthusiastic and vigorous, and expressed his good wishes for future successes for clean air in the region on what might be his last opportunity of attending a meeting as Director.

After lunch, as guests of the Borough Council, the meeting inspected an exhibition staged by Shell-Mex & B.P. Ltd., and heard a lecture on the Company's work on smoke prevention and measurement, chimneys and related matters concerning the industrial uses of oil. The speaker was John deKeyzer, Industrial Fuels Engineer, who was introduced by A. J. Watt, Manager, Industrial Sales, both of the Industrial Markets Division of Shell-Mex & B.P. Ltd.

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### Health Hazards in Industry

This is the title of an explanatory brochure issued by the Scottish Occupational Health Laboratory Service Ltd. The service is a non-profit-making organization whose management committee consists of representatives of both the Scottish T.U.C. and Management drawn from different industries and representing different geographical areas of Scotland. It is led by Professor A. Mair, of the Department of Public Health and Social Medicine, University of Dundee. The service deals especially with noise, dust, and toxic hazards in industry. In addition to the Laboratory at Dundee there is also a specially-equipped mobile laboratory which can undertake extensive studies at any location. Any employer in the country can call upon the service for assistance. The brochure referred to and other information can be obtained from the Laboratory at 9 Dudhope Terrace, Dundee.

### Museum Climatology

A conference with this title was held in London in September last by the International Institute for the Conservation of Historic and Artistic Works. The first day was devoted to papers on air pollution, as follows: "The chemistry of atmospheric pollution", by Professor A. J. Haagen-Smit; "Studies on the nature of urban air pollution", by R. E. Waller; "La pollution atmosphérique à Paris", by Mme. S. Delbourgo; "Effect of sulphur pollution on building materials", by T. Stambolov; "Damaging influence of disinfecting agents on sensitive ancient materials", by Dr. H. Jedrzewska; and "Sulphur dioxide and vapour phase deacidification", by J. R. Ede.

### Heating Service

Representatives of the press were invited on 3 November to see a demonstration of a new heat service which the National Coal Board has set up in co-operation with the Ministry of Public Building and Works. The boiler plant visited serves Government properties in Cornwall Terrace, Regents Park, and is one of the conversions of 13 premises recently undertaken by the National Coal Board, involving 23 boilers ranging in capacity from 82,500 to 1,292,000 B.t.u./h. The visitors were impressed by the cleanliness of the boilerhouse which was supplied by an automatic firing equipment burning anthracite grains. The aim of the heat service which was started on 1 August, 1967, is to reduce fuel costs by labour saving and improved fuel efficiency. This has been combined with the introduction of a heat service contract with Earleymil Ltd. covering the operation and maintenance of these plants for a period of five years. Daily visits are made on a regular scheduled basis by a supervisor and two operators who carry equipment for boiler and flue cleaning and who remove the ash or clinker after inspection.

# SMOKE CONTROL AREAS

## Progress Report

### Position to 1 October, 1967—TOTALS

| | England | Wales | Scotland |
|---|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation | 44 | — | 1 |
| *Acres*, 3,400 | | | |
| *Premises*, 41,060 | | | |
| **Smoke Control Areas in Operation** | 2,301 | 5 | 81 |
| *Acres* | 569,567 | 418 | 35,724 |
| *Premises* | 3,054,627 | 2,352 | 211,694 |
| **Smoke Control Orders** | | | |
| *Confirmed* | 210 | 1 | 29 |
| *Submitted* | 89 | — | 3 |
| **Grand Totals** | 2,644 | 6 | 114 |

*The lists below are supplementary to the information in the last issue of "Smokeless Air" (Autumn 1967) which gave the position up to 1 July, 1967. They now show changes and additions to 1 October, 1967.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.*

## ENGLAND

## NEW SMOKE CONTROL AREAS IN OPERATION

**Northern**

*Tyneside and Wearside*

Hebburn U.D. No. 7. Longbenton U.D. No. 1. Newburn U.D. Nos. 7 and 8. Newcastle-upon-Tyne C.B. No. 11. South Shields C.B. No. 1. Tynemouth C.B. Nos. 3, 4, 5 and 6.

*Teeside*

Billingham U.D. No. 4.

**Yorkshire**

*West Riding (North)*

Aireborough U.D. No. 21. Bingley U.D. No. 13. Bradford C.B. (Bierley), Halifax C.B. No. 12. Heckmondwike U.D. No. 6. Horbury U.D. No. 4. Horsforth U.D. No. 22. *Leeds C.B. No. 57. Leeds C.B. Nos. 60-63. Mirfield U.D. No. 8. Normanton U.D. No. 1. Ossett B. No. 9c. Pontefract B. Nos. 3-8. Pudsey B. Farsley South No. 5. Rothwell (Yorks) U.D. No. 8. Sowerby Bridge U.D. No. 4. Spenborough B. No. 8. Stanley U.D. No. 1.

*West Riding (South)*

Darton U.D. Nos. 5 and 6. Dearne U.D. No. 1. Doncaster C.B. No. 9. Rotherham C.B. Broom Lane No. 1. Rotherham C.B. Kimberworth Park No. 8. Wath-upon-Dearne U.D. No. 3.

**North Western**

*South Lancashire and North-East Cheshire*

Bolton C.B. (Halliwell and Smithills). Cheadle and Gatley U.D. No. 8. Droylesden U.D. No. 11. Heywood B. No. 7. *Leigh B. No. 4. Middleton B. (Langley No. 10B). *Rochdale C.B. (Healey and Syke). Sale B. No. 7. Stockport C.B. (Edgeley/Grenville). *Urmston U.D. No. 5. Westhoughton U.D. No. 3. Whitefield U.D. No. 7. Worsley U.D. No. 4.

*Central Lancashire*

Brierfield U. D. No. 1. *Burnley B. No. 8. Fulwood U.D. No. 1. Nelson B. No. 2.

*Merseyside*

Birkenhead C.B. (No. 5 Upton). Ellesmere Port B. No. 7. Litherland U.D. No. 1. Liverpool C.B. Nos. 21 and 22. Runcorn U.D. No. 3. Wallasey C.B. No. 12. Warrington C.B. Nos. 8 and 9. Widnes B. No. 6.

**Midlands**

*Derby, Nottingham and Chesterfield*

Beeston and Stapleford U.D. No. 8. Ilkeston B. No. 2. Nottingham C.B. No. 8A. Sutton-in-Ashfield U.D. Nos. 1 and 2.

*West Midlands*

Aldringe-Brownhills U.D. Nos. 24 and 25. *Birmingham C.B. No. 99. Coventry B. Nos. 10-14. Dudley C.B. Nos. 47 and 48. Halesowen B. No. 25. *Sedgeley U.D. No. 9. (Now part of Dudley C.B.) Solihull C.B. Nos. 11-13. Stourbridge B. Nos. 23 and 24. Sutton Coldfield B. No. 8.

*Potteries*

Kidsgrove U.D. Nos. 12 and 13. Stoke-on-Trent C.B. No. 16.

**London**

*Greater London Boroughs*

Barnet L.B. Nos. 4 and 5. Brent L.B. No. 3. Camden L.B. (St. Pancras No. 8). Camden L.B. Hampstead No. 9. Ealing L.B. Nos. 28 and 29. Enfield L.B. No. 14. Hackney L.B. No. 11. Harrow L.B. No. 13. Hillingdon L.B. No. 6. Islington L.B. Nos. 24 and 25. Kensington and Chelsea (Redcliffe and Brompton). Kingston-upon-Thames L.B. No. 9. Lambeth L.B. No. 18. Lewisham L.B. Nos. 22 and 23. Merton L.B. Nos. 3 and 4. Newham L.B. No. 4. Redbridge L.B. Nos. 11-13. Richmond-upon-Thames L.B. (Barnes No. 8). Sutton L.B. No. 16. Tower Hamlets L.B. Nos. 1 and 7 (Stepney Area). Tower Hamlets L.B. No. 2. Wandsworth L.B. No. 1.

**Local Authorities Outside the Black Areas**

Basildon U.D. Nos. 5 and 6. *Exeter C.B. (Stoke Hill No. 1). Hazel Grove and Bramhall U.D. No. 2. Heanor U.D. No. 2. High Wycombe B. No. 14. Luton C.B. No. 5. *Meriden R.D. No. 1. Potters Bar U.D. No. 2. Rugby B. No. 6. Scunthorpe B. No. 6. Skelmersdale U.D. No. 2. Skipton U.D. No. 4. Todmorden B. No. 5. Waltham Holy Cross U.D. No. 1. Watford B. Cassiobury No. 5. Whiston R.D. No. 1. Wortley R.D. (Angram Bank).

## NEW ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*

Felling U.D. Nos. 3 and 4. Gateshead C.B. No. 11.

*Teeside*

Stockton-on-Tees (Hartburn No. 1).

**Yorkshire**

*West Riding (North)*

*Bradford C.B. (West Powling). Horbury U.D. No. 5. Morley B. Nos. 29, 34 and 35. Rothwell U.D. No. 11.

*West Riding (South)*

Wombwell U.D. No. 1.

**North Western**

*South Lancashire and North-East Cheshire*

Denton U.D. No. 12. Heywood B. No. 7A and 8. Kearsley U.D. (Mossfield/Rd) No. 2. *Oldham C.B. No. 10. Rochdale C.B. (Deeplish and Stoneyfield). Salford C.B. Nos. 12 and 15. Stockport C.B. (Hollywood/Heaton Lane). Stretford B. No. 11.

*Central Lancashire*

Accrington B. Nos. 6 and 7. Padiham U.D. No. 8.

*Merseyside*

Liverpool C.B. No. 26. St. Helens C.B. No. 5A.

**Midlands**

*Derby, Nottingham and Chesterfield*

*Derby C.B. No. 12. Derby C.B. No. 13. Long Eaton U.D. (Wimpey's Estate No. 1). Long Eaton U.D. (Lower Brook Street No. 1). Mansfield Woodhouse U.D. No. 1. *Sutton in Ashfield U.D. No. 3.

*West Midlands*

Aldridge-Brownhills U.D. No. 27. *Coventry B. No. 9. Halesowen B. Nos. 28 and 29. Sutton Coldfield B. Nos. 9 and 10. Walsall C.B. Nos. 10, 11 and 12.

**South West**

*Bristol*

Bristol C.B. No. 8.

**London**

*Great London Boroughs*

Ealing L.B. No. 32. Enfield L.B. No. 13. Harrow L.B. No. 14. Kingston-upon-Thames L.B. Nos. 11 and 12. *Lewisham L.B. No. 24. Merton L.B. No. 7. Tower Hamlets L.B. No. 3.

**Local Authorities Outside the Black Areas**

Chatham B. No. 5. Cheltenham B. Nos. 2 and 3. Crewe B. No. 4. Grantham B. No. 13. *Ramsbottom U.D. No. 1. Reading C.B. No. 11. *Rugby B. No. 7. Slough B. No. 12. Southampton C.B. No. 6. Todmorden B. No. 6. Watford B. Harwoods No. 6. Watford B. No. 7.

### NEW ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Tyneside and Wearside*

Boldon U.D. Nos. 6 and 7. Hebburn U.D. Nos. 8, 9 and 10.

**Yorkshire**

*West Riding (North)*

Leeds C.B. Nos. 67 and 69. Pudsey B. No. 6. Rothwell U.D. No. 12. Stanley (Durham) Lintz No. 1. Stanley (Durham) East Stanley No. 1. Wakefield B. (Thornes Lane No. 1). Wakefield B. (Horbury Road No. 1).

**North Western**

*South Lancashire and North-East Cheshire*

Ashton-under-Lyne B. No. 8. Chadderton U.D. No. 9. Droylesden U.D. No. 12. Dukinfield B. Nos. 8 and 12. Farnworth B. No. 3. Leigh B. No. 7. Middleton B. (Hollin Lane No. 11). Middleton B. (Whittle Lane No. 12). Middleton B. (Rhodes Green No. 13). Middleton B. (Top of Middleton No. 14). Stockport C.B. (Portwood/Newbridge Lane). Tottington U.D. No. 1. Tyldesley U.D. No. 1.

*Central Lancashire*

Barrowford U.D. No. 1. Darwen B. No. 3. Nelson B. No. 3.

*Merseyside*

Bebington B. No. 20. Ellesmere Port B. No. 8. Runcorn R.D. No. 2. Wallasey C.B. (Saughall).

**Midlands**

*Derby, Nottingham and Chesterfield*

Alfreton U.D. No. 1.

*West Midlands*

Birmingham C.B. Nos. 91, 125, 144-147. Dudley C.B. No. 50.

*Potteries*

Newcastle-under-Lyne B. No. 7.

(*Continued on next page*)

## Smoke Control Areas

### Summary of Progress as at 30 September 1967

| (1) *Region* | (2) *No. of acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage* of total black area acreage in the region so covered* | (4) *No. of premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage of total black area premises in the region so covered* |
|---|---|---|---|---|
| Northern .. .. | 22,481 | 17·93 | 105,813 | 19·13 |
| Yorkshire and Humberside .. | 124,235 | 32·98 | 415,005 | 35·53 |
| East Midlands .. | 37,240 | 13·00 | 123,020 | 24·03 |
| Greater London .. | 187,276 | 57·26 | 1,699,844 | 64·39 |
| North Western .. | 129,600 | 32·30 | 598,678 | 35·15 |
| West Midlands .. | 65,200 | 26·18 | 277,663 | 26·40 |
| South Western .. | 7,201 | 27·33 | 26,650 | 17·89 |
| Totals (black area) | 569,963 | 32·13 | 3,206,889 | 41·24 |
| Outside black areas (all parts) .. | 100,838 | | 351,621 | |
| GRAND TOTALS | 670,801 | | 3,558,510 | |

* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country).

*Note*

Statistics in respect of Wales and Monmouthshire are no longer included.

**London**

*Greater London Boroughs*

Barnet L.B. No. 6. Brent L.B. No. 5. Ealing L.B. Nos. 33 and 34. Greenwich L.B. (Charlton). Harrow L.B. No. 15. Islington L.B. Nos. 26 and 27. Kensington and Chelsea L.B. (Brompton/Queens Gate). Kingston-upon-Thames L.B. No. 13. Redbridge L.B. No. 14. Wandsworth L.B. No. 2. Westminster L.B. (Queen's Park).

**Local Authorities Outside the Black Areas**

Bedford B. No. 4. Blaby R.D. No. 4. Blackburn C.B. No. 8. Hale U.D. No. 1. Hazel Grove and Bramhall U.D. No. 3. Heanor U.D. No. 3. High Wycombe B. No. 15. Meridon R.D. No. 2. Skipton U.D. No. 5. Thurrock U.D. No. 5. Waltham Holy Cross U.D. Nos. 2-4. Winsford U.D. No. 9.

## SCOTLAND

### NEW SMOKE CONTROL AREAS IN OPERATION

Dundee (Coldside). Glasgow (Pollokshaws No. 2).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Coatbridge (Townhead). Dundee (Law). Falkirk No. 6. Glasgow (Knightswood Nos. 1 and 2).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Clydebank (Parkhall No. 6). Johnstone Burgh. Renfrew Burgh No. 4.

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## *Even the Birds*

To mark the completion of smoke control in the Netherton district of Bootle, the *Bootle Times Herald* published interviews with residents in smoke control areas already in operation on what the change had meant to them. "Who ever invented smoke control deserves a medal", was the warm tribute of one housewife. "It's been a godsend to us. We have an open smokeless fire which is much warmer than a coal fire. The fuel might be a bit more expensive, but you save in other ways." Another resident remarked on cleanliness: "The carpets and curtains stay cleaner much longer, and the wallpaper and paintwork is as good as if the place had been decorated." "The difference in the air is really amazing", said another lady, "it's like living in the country".

No longer smuts on his car, or soot on the privet hedge, was the comment of a male resident, but the observation we liked best was from another man: "Even the birds in the garden look cleaner."

Congratulations to Bootle and its perceptive people—and thanks to the editor for a feature so helpful to the cause of clean air.

### Bedfordshire Brickfield

The fletton brick industry in Bedfordshire causes a number of problems, including air pollution, amenities, agriculture, and the landscape. A very informative report, dealing with the present situation, and the future, has been prepared by the Bedfordshire C.C. County Planner, Geoffrey Cowley, for the Planning Committee, in which the whole problem is comprehensively surveyed. A meeting to discuss the report is being convened to be held in January, and we are therefore deferring a review of the report in order to be able to combine it with an account of the meeting in our next issue.

### Electro-Heat Congress

The sixth International Electro-Heat Congress, organized by the International Union for Electro-Heat (UIE), in conjunction with the British National Committee for Electro-Heat, will be held at Brighton from 13 to 18 May, 1968. It is expected that there will be about 100 papers which will provide the opportunity on an international plane for widely-ranging discussions on the many applications of electricity in the field of industrial process heating. Further information may be obtained from the Congress Office, U.I.E., 6 Trafalgar Buildings, 1 Charing Cross, London, S.W.1.

five recommended
solid smokeless fuels
for domestic
solid fuel appliances

consult your Gas Board
regarding availability of
these recommended fuels

# Air Pollution Abstracts

## Abstracts of Papers Presented at N.S.C.A. Annual Conference, Blackpool 1967

**1020. Presidential Address.** Charrington, Sir John. The paper reviews the programme of the conference and mentions some of the problems that need no longer be discussed, thus indicating great advances made to clean air in recent years. The author considers that the National Society for Clean Air report on air pollution from road vehicles and that of the Ministry of Transport's "Cars for Cities", support and complement each other. Progress in domestic smoke control has been disappointingly slow and it is stressed that a great deal depends on the fuel situation over the next few years and that all smokeless fuels have their parts to play. The facts concerning the future availability of solid smokeless fuels are reviewed and it is considered that the situation is on the whole satisfactory. The author concludes that the National Society for Clean Air, in spite of its considerable achievement as a driving force for clean air, has not yet obtained its objectives and must continue to press with the cause.

**1021. Air Pollution from Road Vehicles. The Report of the Technical Committee.** The report is divided into six sections: the nature and extent of the problem; pollution from petrol motor vehicles and technical methods of control; pollution from diesel motor vehicles and technical methods of control; legislative and administrative aspects of control; road vehicle pollution and town planning; and conclusions. In addition there are appendices on existing regulations, the motor vehicle control position in the U.S.A., and research on motor vehicle exhaust gases in the Federal Republic of Germany. A bibliography is included at the end of the report.

**1022. Some Specific Air Pollution Problems.** Bonnell, J. A. and Lawther, P. J. The paper illustrates how pollution by certain materials recognized as hazardous in industry can be a source of disease at sites remote from the factory. Three materials are specifically examined in detail: beryllium, asbestos and fluorides. The paper concludes with a discussion on on the control of radioactive materials.

**1023. Clean Air and the North West Environment.** Aylmer Coates, U. The paper reviews the condition of the urban environment in the north-west region, and emphasizes that the degree of success achieved in environmental improvement depends as much on the success of measures to purify the air as on other improvements. A detailed study of the region's environmental problems made by the Environment Committee of the Regional Economic Planning Council is referred to and discussed. Improvements due to smoke control are believed to be among the factors that are slowing down the rate of migration from the region that has been a feature of past decades.

**1024. Some Mineralogical Aspects of Air Pollution Damage to Limestone.** Henley, K. J. Samples from a limestone balustrade located in London, which has remained uncleaned since erection in 1890, have been investigated using mineralogical techniques. The following samples were examined: (1) the unaltered limestone (Portland Stone); (2) friable carbonaceous deposits on the surface of the limestone; (3) hard carbonaceous stalactites adhering to the edge of the upper limestone coping; (4) hard carbonaceous deposits near the base of the columns of the balustrade; (5) rotted and crumbling limestone near the base of the columns; and (6) fossil remains projecting above the average level of the limestone surface. The examination indicated that the limestone had undergone considerable attack by atmospheric sulphur dioxide (and carbon dioxide) with the formation of gypsum ($CaSO_4 \cdot 2H_2O$): this had precipitated in the stalactites and carbonaceous deposits, being formed from the calcite ooliths in the limestone. The fossil evidence gives an average rate of erosion of the limestone surface as 16 kg/m$^2$ century.

**1025. Corrosion by Air Pollution—A Review.** Goss, J. R. A literature review is given of the chemical and physical effects of air pollution on the corrosion of stonework and building materials, metals, textiles, leather, paper and rubber, and paint. A short section on the costs of corrosion is also included.

**1026. Clean Air and Future Energy.** Schumacher, F. E. (Des Vœux Memorial Lecture). The first part of the lecture discuss the protection and conservation of the environment and the way in which the environment is threatened by the application of narrow economic criteria. The need for ecological studies and applications is stressed. The second part of the lecture consists of an adversely critical survey of the situation arising from the development of nuclear power, and it is said that "the danger to humanity created by the so-called peaceful uses of atomic energy is hardly ever mentioned". Emphasis is laid on the question of the disposal of atomic wastes, and references are given to the 35 sources that are quoted.

**1027. The Emission of Grit and Dust from Furnaces.** Hicks, D. In the introduction brief reference is made to the inherent conflicts in achieving clean air. There then follows a section that deals with the principles that are necessary for progress and special attention is given to the concept of what is reasonable and practicable. The next section of the paper emphasizes the need for codes of good practice. Methods of sampling grit and dust are first discussed in terms of the essential principles governing the selection of a standard method and then the method selected by the Grit and Dust Working Party is described. Before formulating standards of emissions not to be exceeded, it is first necessary to have a logical classification of furnaces and the one adopted by the Working Party is given. The recommended standards for solid and oil-fired boilers are then discussed and followed by a section dealing with other types of furnaces and the standards for those furnaces in which the stock does not contribute to the emissions are also given. In the final part of this section of the paper it is shown that there are insufficient data from which to formulate standards for furnaces in which the stock contributes significantly to the emissions. The need to obtain the data is urgent.

**1028. The Cost of Domestic Smoke Control.** Smith, A. R. Progress in dealing with domestic smoke has fallen well behind the objective visualized by the Beaver Committee and the domestic chimney is now the dominant source of air pollution. The reasons for this situation are various but the one singled out for discussion in the paper is that of cost. There are two aspects: the national and the local. It is estimated that the total capital cost of converting all the remaining premises in the Black Areas of England and Wales would be less than £100 million. This figure is considerably less than the annual cost of the damage caused by air pollution from domestic sources. It is also triflingly small compared with a number of items of annual national expenditure shown in the National Income and Expenditure Statistics. There is, therefore, no case whatever for the argument that as a nation we cannot afford the capital sums involved in fully implementing the domestic provisions of the Clean Air Act. The local aspects of the problem raise different issues. It is clear beyond doubt that new policies are required in relation to domestic air pollution. Certain suggestions are advanced in the paper as a basis for discussion.

**1029. Smokeless Heating in New Housing.** Report of an Inquiry by the N.S.C.A. Parliamentary and Local Government Committee. To ascertain what steps were being taken by local authorities to ensure that new housing was smokeless from the start, a questionnaire was sent to all local authorities in England, Wales and Scotland. 616 authorities completed the questionnaire and the replies to the seven questions asked are summarized in the report. An additional question was asked to local authorities with established smoke control areas. The replies showed that in many areas solid fuel was not being used in new housing, and that in other developments comparatively few authorities had taken steps to ensure that smokeless fuel would be used on appliances intended for its use. In the replies to the question addressed to authorities with smoke control areas it was clear that the selling of bituminous coal in such areas was widespread, and that the general view was that it should be made illegal.

**1030. Industrial and Municipal Incineration of Refuse.** Ostle, E. J. Consideration is given to the problems of the incineration of industrial wastes, which are illustrated by a descriptive case history. Municipal incineration of refuse is then discussed and the technical aspects of combustion and of control of emissions are examined. An appendix describes four continuous grate systems for municipal incineration that are currently being offered in this country.

**1031. The Role of Oxygen-Fuel Burners in Scrap Consuming Steelmaking Processes and their Effect on Fume Emission.** Spenceley, G. D. The trend of scrap consumption for the various steelmaking processes indicates the need to increase scrap melting capacity in the future. The paper briefly describes the F.O.S. process which is a new steelmaking technique for cold charges using oxy-fuel burners. Information is also given on the use of oxy-fuel burners for assisted melting and refining in existing arc furnaces. Steelmaking processes are unfortunately accompanied by fume emission and it is shown that oxy-fuel burners can be of benefit in its suppression.

# GENERAL ABSTRACTS

**1032. A Comparison of Natural and Urban Aerosol Distribution Measured with the Aerosol Spectrometer.** Horvath, H. (Environm. Scie. & Techn. August 1967, **1,** No. 8, 651-655). Air samples were collected with the Goetz aerosol spectrometer both in town and in the mountains. By counting the deposited particles in the microscope, the size frequency of the aerosol was determined. Owing to the resolution power of the microscope, the size range measured was limited to particles larger than 0·27 micron in diameter. The size frequency curve has in general the same shape both in town and in the mountains, whereas the total particle number varies widely, i.e. 5,000 particles per cc. downtown, fewer than 800 particles per cc. in the residential area, and fewer than 300 particles per cc. in natural aerosols. Normally, the particle number decreases during rainfall and increases in fair weather, whereas the mode of particle size increases slightly during rainfall and decreases during fair weather, especially in haze. The smallest particles occur in combustion aerosols. Investigations on the metastability of the aerosol particles showed that the urban aerosol is less stable than the natural aerosol.

**1033. Ammonia in Auto Exhaust.** Harkins J. H. and Nicksic, W. (Environm. Scie. & Techn. Sept. 1967, **1,** No. 9, 751-2). Ammonia in the exhaust from a laboratory V-8 engine was measured to see if the amount was sufficient to account for ambient levels. Exhaust samples were cold-trapped from an engine operated at both steady-state conditions and over the California State Motor Vehicle Pollution Control Board traffic cycle. The concentration in the condensate ranged from 1 p.p.m. at idle to 6 p.p.m. at 50 m.p.h. road load and averaged 2·2 p.p.m. over the entire traffic cycle. The presence of nitrogen-containing detergent additives or lead antiknock compound in the fuel did not affect the amount of exhaust ammonia. On the basis of the data, up to 10 per cent of ammonia in the atmosphere can be accounted for by ammonia discharged from motor vehicles.

**1034. The Continuous Analysis of Sulphur Dioxide in Gaseous Samples.** Lyshkow, N. A. (J.Air Poll.Contr.Ass. Oct. 1967, **17,** No. 10, 687-9). Sulphur dioxide is quantitavely scrubbed from atmospheric and stack gas samples through the use of a unique rotary scrubber which provides collection efficiencies in excess of 97 per cent in the PPB through PPM range. The scrubber in addition permits the use of water as a scrubbing vehicle which, when combined with a bleached pararosanaline reagent, provides high specificity and sensitivity for the analysis. By the elimination of the tetrachloromercurate solution, cell staining is eliminated and the stability required for continuous analysis by the reagent is achieved.

**1035. Influence of intake air temperature on smoke emission in diesel engine.** Gross-Gronomski, L. et al. (J.Inst. Fuel, Aug. 1967, **40,** 319, 352-357). Tests, carried out on a four- and a two-stroke diesel engine, are discussed. Inlet temperature variations range from 23° to 112°C (74° to 235°F). Smoke intensity is shown as a function of inlet air temperature at different sets of constant engine operating conditions (fuel and air consumption, air/fuel ratio, output) and as a function of these parameters at different constant intake air temperatures. Variations in running parameters, influenced by inlet air temperature, for constant smoke intensity are also presented. The measurement results discussed can be useful for the diesel smoke theory as well as for practical needs of diesel manufacturers and users, especially in connection with pressure charging and aftercooling from one side and with geographical location, seasonal, and daily temperature variations on the other side.

**1036. Contribution to the Methodology of Fibrous Dust Measuring** (In Czech). Simecek, J. (Zdravotni Technika a Vzduchotechnika, **10**, No. 3, 113-122). Mentioned are the methodology and the results of comparison measurements of asbestos and cotton dust compound in the atmosphere. The measurements were taken in an establishment for the treatment of asbestos by means of membrane filters, filters or organic microfibres and the electrostatic precipitator SARTORIUS. A perfect comparability and reproducibility of the results of all three methods appeared. The microscopic pictures show some difficulties in the detection of dust dispersion. The methodology of determining the incombustible constituents of the dust content is described. According to the results of determining the ash content it is possible to draw a conclusion of the asbestos content in the dust.

**1037. Comparative studies of propane and butane as dual-fuel engine fuels.** Karim, G. A. and Rogers, A. (J.Inst. Fuel, Nov. 1967, **40**, No. 322, 513-522). The paper briefly summarizes some of the main findings of study of the dual-fuel behaviour of both propane and butane. A complete range of pilot diesel fuel quantities was covered from extremely small values through to 100 per cent diesel, and for a range of charge inlet temperatures from ambient to 120°C. Thereby, a general performance comparison between 'pure' diesel and dual-fuel operation was made, from which it became apparent that under medium to high load operation,.on pilots in excess of some 30 per cent of the maximum, dual-fuel operation can give appreciable gains over pure diesel operation in both power and fuel consumption. In keeping with the findings of previous workers, however, operation on small pilots, particularly on low power, is markedly inefficient. Under all pilots, performance is limited by the onset of uncontrolled combustion knock. Increases in both inlet charge temperature and pilot give significant reductions in the gas fuel to air ratio at which knocking occurs. A technique for predicting the variation of the knock-limited power output with inlet charge temperature developed earlier, was found to be successfully applicable to propane and butane over the complete pilot range.

**1038. An experimental study of the dispersion of the emissions from chimneys in Reading. 1: The study of long-term average concentrations of sulphur dioxide; 2: A description of the instruments used.** Marsh, J. K. and Foster M.D. (Atmospheric Environment, Sept. 1967, 1, No. 5, 527-559).

The dispersion of $SO_2$ in Reading has been studied for a period of 15 months. Continuous measurements of the six-hour average concentrations were made at 40 sites, and meteorological measurements were made for each six-hour period. A detailed inventory was prepared of both domestic and industrial sources of $SO_2$. It is shown that, of various meteorological variables examined, the ambient air temperature has the predominant effect on the $SO_2$ concentration in the air. The basis for the "degree-day" method is confirmed in that the average concentration over the town increases linearly with the difference of the air temperature below a datum value of 15°C. Isopleths of annual $SO_2$ concentration have been drawn for eight wind directions; these show that the distribution of pollution is not greatly affected by wind direction although variations in the average air temperatures for different wind directions affect the general level. A pollution rose for the town as a whole shows that there is an excess of $SO_2$ arriving from the east and this is attributed to pollution from London; some pollution also arrives from external sources in other directions.

The annual concentration of $SO_2$ at individual sites is strongly correlated with the consumption of local installations emitting their effluents from chimneys less than 21 metres high; an empirical equation is given for Reading relating annual concentrations with consumption within 1,000 miles of the measuring point. Pollution roses have been drawn for each measuring site and these give a qualitative indication of the pollution from Reading, but a detailed comparison of individual vectors with the distribution of sources has failed to show a satisfactory correlation. The pollution roses do not indicate the larger industrial installations and it is considered that the chief contribution to the pollution in Reading is from domestic and low industrial chimneys.

# *Contributions to Cleaner Air*

## News from Industry

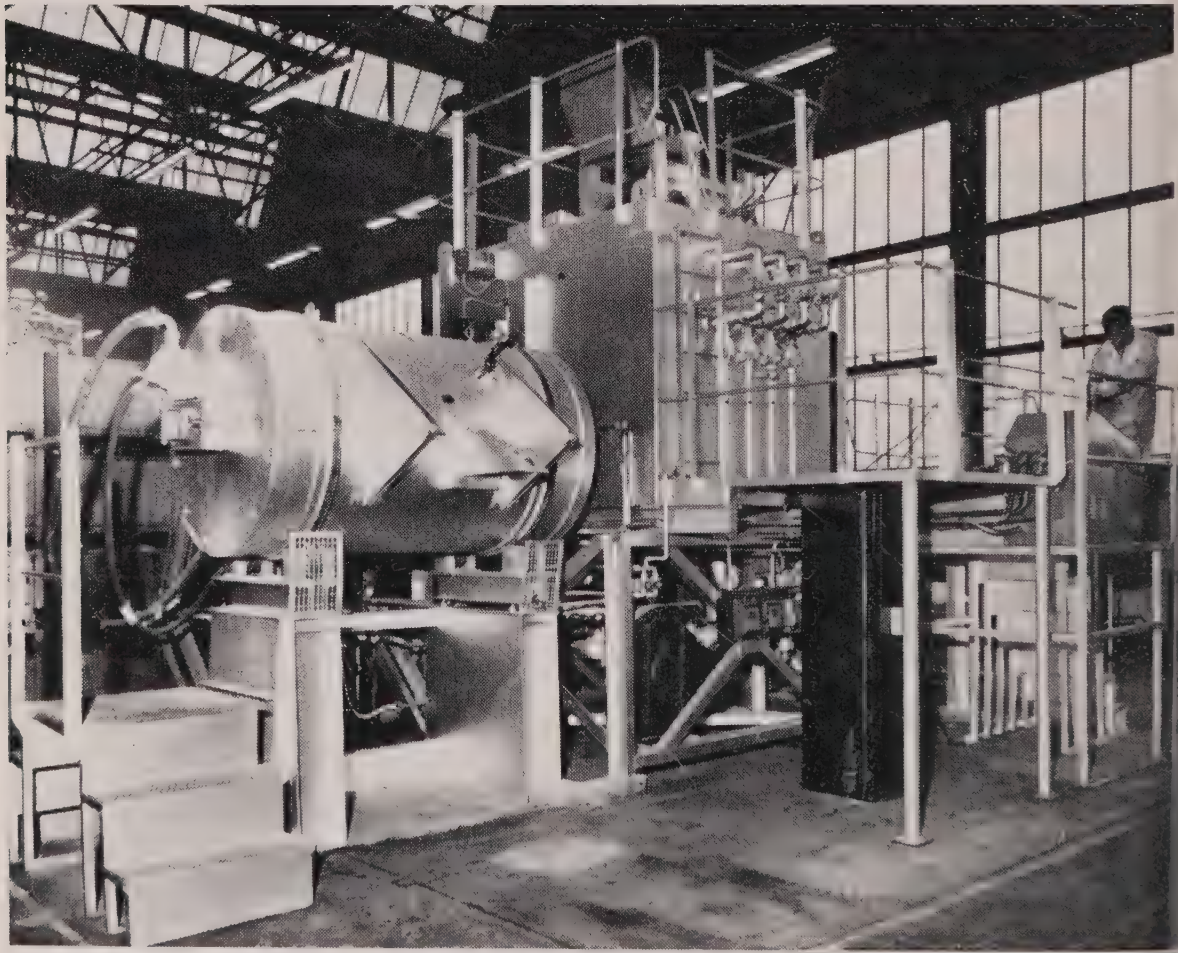
### REVOLUTIONARY NEW MELTER

*Gas Development*

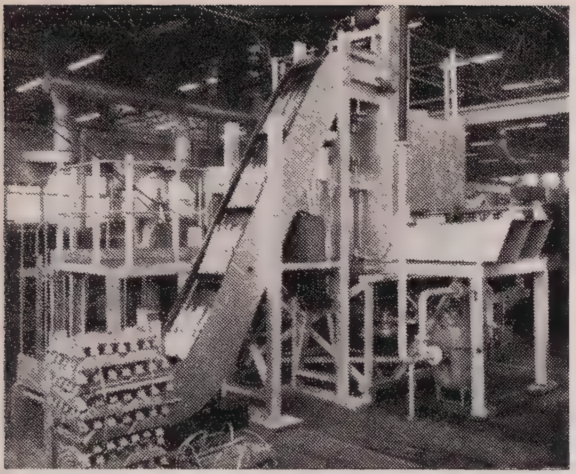
A complex, fully automatic piece of industrial equipment, the capital cost of which it is said will be paid for out of savings from about a year's operation, was shown to the Press recently at Linwood, Renfrewshire.

Installed at the die-casting plant of Rootes (Scotland) Ltd., it is a revolutionary gas-fired furnace called the Hi-Melt Tower. It is used for melting aluminium, holding the molten metal and dispensing the required amounts. The molten aluminium is used by Rootes in their die-casting works in the manufacture of several motor car components, including cylinder blocks.

The Hi-Melt Tower was designed, constructed and installed by the Scottish Gas Board in co-operation with the Gas Council. Original development work, sponsored by the Gas Council, was carried out by the Power Gas Corporation at Stockton-on-Tees. It was commissioned at the Linwood works in March this year and has been operated virtually 24 hours a day, five days a week since. Over an output of 1,200 to 3,700 lb/h., the furnace uses from 28 down to 18 therms of gas per ton. This is about



*The Hi-Melt Tower installed at Rootes (Scotland) Ltd., Linwood. On the left is the holding section, and right is the melting section*



*Showing the automatic ingot feed to the Hi-Melt Tower*

one-third the heat requirement of alternative plant.

Yearly fuel costs with a plant of this kind and gas at 16d. per therm (approximately the national average price of gas to industry) would amount to about £7,250, compared with £21,000 for conventional plant.

Metal losses during melting are reduced to below 1 per cent—representing a saving of at least 100 per cent over all other types of equipment. With aluminium at £175 a ton, a saving of 1 per cent in metal loss, at a continuous melting rate of one ton per hour, would represent a gain of over £10,500 a year.

Other advantages, proved by six months' commercial operation under close scrutiny, are reliability, flexibility and the need for the minimum of maintenance.

The Hi-Melt Tower is composed of three main sections—elevator (charging), melting, and holding (delivery).

Full automation covers proportional type automatic temperature controls, which serve the melting and holding furnaces, and weight loaded cells in the support legs of the holding furnace, which provide an override control to ensure that melting ceases once the holding furnace is filled to its capacity of 1,000 lb. Melting is resumed as soon as a quantity of metal is drawn from the holding furnace.

Aluminium ingots, weighing from 10 to 50 lb. each, are fed into the top of the tower of the melting furnace by means of a slat-type hydraulically operated conveyor. The rate of cold metal feed is controlled automatically by metal off-take from the holding furnace.

The metal level in the feed tower of the melting furnace is maintained for the sake of thermal efficiency at an optimum height by two light cell units, positioned near the top of the tower and throwing beams across it. When the metal level falls so that the lower beam is "made", the conveyor starts up and refills the tower until the upper beam is obstructed.

Apart, therefore, from placing the metal on the conveyor and discharging molten metal, the operation of the plant is automatically controlled.

In the melting furnace, conventional reverberatory furnace firing is used in conjunction with an inclined dry furnace hearth. On the right of the combustion chamber a diverging feed tower gives an average 5 ft. depth of metal billets for effective load recuperation.

The aluminium ingots are preheated to the plastic state and moved at the critical temperature by two automatically controlled hydraulic pushers into the furnace itself.

Metal loss is extremely low because of oxide "skin" protection of ingots and rapid melting, and averages 0·69 per cent of feedstock. The comparatively small dross formation in consequence is easily removed from the hearth through a hydraulically operated door.

Discharge of metal through the pouring spout is effected by two hydraulically operated power cylinders, actuated from the control panel. In this way the furnace drum is inched round to govern the quantity to be discharged into the receiving pot.

## AUTOMATED POLLUTION ANALYSIS

Technicon International Division held a European Symposium in Brighton from 13 to 15 December, when nearly a hundred papers were presented on aspects of automation in analytical chemistry.

The papers were grouped under twelve sections, one of which was on water and air pollution analysis, detection and control, centring largely on the uses of the Technicon AutoAnalyzer. This versatile apparatus was shown at the N.S.C.A. Blackpool exhibition, but it is of such general interest and has so many potentialities that a short description of it here is appropriate.

To quote the maker's own words: "The AutoAnalyzer air monitoring system is a continuous, automatic sentinel that sniffs out *specific* air pollutants, quantitates them by wet chemical techniques, and records their concentration as a continuous, timed line on a strip chart recorder."

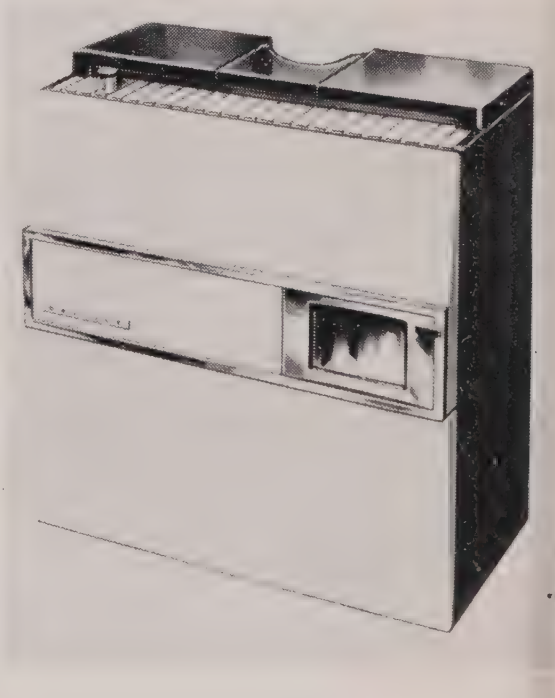
Miniature unit operations are so arranged and interconnected that an air (or industrial gas) sample is continuously drawn into the system and contacted by reagents. As the sample flows through a closed system in which all variables are controlled, reagents "zero" on each contaminant to generate a characteristic colour. The intensity of this specific colour—an accurate index of the amount of pollutant present—is read in a colorimeter and charted on a recorder. If required, the recorder can be linked with an alarm that is actuated if a pre-determined concentration of a pollutant is exceeded.

The system is self-standardizing, making possible continuous, unattended operation for as long as a week before supplies have to be replenished. One, two or three absorbing columns may be mounted on the rack to provide up to three simultaneous analytical channels. If more analyses are required, two rack units are positioned next to each other and operated independently. The pollutants that may be so analyzed include fluorine, lead, ammonia, sulphur dioxide and trioxide, cyanide, hydrogen sulphide, nitrogen oxides, oxidants, aldehydes, acrolein, ozone, and micro-organisms.

The recent Brighton symposium had few papers on air pollution, but a similar event in New York in 1965 included several. Among them were papers on "Continuous Monitoring of Ambient Atmospheres with the Technicon AutoAnalyzer", "Automated Laboratory Procedures for the Analysis of Air Pollutants", "New and Improved Procedures for Gas Sampling and Analysis in the National Air Sampling Network", "Detection of Micro-organisms by an Automated Chemiluminescence Technique", and "A Continuous Monitor for Tetraethyl Lead and Tetramethyl Lead Vapour in Air". Inquiries about reprints of these papers and other information about the AutoAnalyzer may be obtained from Technicon Instruments Co. Ltd., Hanworth Lane, Chertsey, Surrey.

## DEVILLE

Deville is a well-known firm manufacturing heating equipment for over a century, at Charleville-Mezieres, France. Between 1910 and 1939 they sold over 2,000 units a year in Britain, but have only now come back to the British market with a range of domestic oil-fired appliances that are selling at a rate of 120,000 a year on the continent.



*One of the Deville oil-fired space heaters—the Monica 1 (32,000 Btu/h.)*

*An attractive view of part of the Mardyke Farm Estate, one of the many housing developments at the London Borough of Havering. The estate is of course smokeless, and the principal fuel used is gas, with Sugg Halcyon warm air central heating units and Ascot gas water heaters.*

The heaters include space heaters, boilers, boilers with cooker, and warm-air units. All operate on the economical blue flame system, which provides the most efficient form of combustion, giving a blue flame at all settings and preventing soot formation, smoke and smell. There is a wide range of sizes, the larger ones being of course suitable for central heating. Control thermostats are included or can be fitted, and make operation fully automatic. Our illustration shows the attractive appearance of one of the space heaters. Further information from G. M. C. Lawson, "Deville", Warnham, Horsham, Sussex.

## DISTRICT HEATING CONSORTIUM

Growing interest in district heating in Britain is shown by the formation of the United Kingdom District Heating Consortium, the address of which is Don Road, Sheffield 9. The consortium has been formed by the parent company of United Danish Heating and Engineering Company, Messrs. Bruun and Sorensen A/S, of Denmark, with the Brightside Heating and Engineering Co. Ltd., of Brightside, Sheffield, and Christian and Nielsen Ltd., of London. The consortium has been formed for the special purpose of planning, designing and building district heating plants and incineration plants in the U.K., and the companies concerned will direct their activity in this field through the Sheffield office.

## TRANSPORT FOR POWER

Readers who are interested in industrial transport developments will like to know about an attractive illustrated booklet entitled *Transport for Power*, issued by the Central Electricity Generating Board.

For electricity generation in recent years designers have progressively developed larger and more efficient plant units. Without allowing for inflation, these have reduced the cost of new plant by over 25 per cent in the past 15 years, and at the same time have increased generation efficiency from 22 to 37 per cent, with great savings in installation and running costs.

To support these advances an unremitting effort has been necessary to provide transport facilities for these larger units, and indeed throughout the whole period of the development, progress has very much depended on the increase in size of and weight of the units that could be moved from works to sites. By the early 1960's the load carrying capacity was stretched to the limit and new methods of carrying had to be devised if further development of plant was not to be restricted.

These problems were principally

overcome by the ingenuity of teams of experts who conceived, designed, and developed two special forms of transport, one for the road and the other for the sea. The booklet tells the story of these developments, culminating in the commissioning of road transporters using the hovercraft principle to spread their heavy indivisible loads on weaker roads and bridges, and by heavy load vessels of novel design using a roll-on, roll-off principle of load handling. The combination of these new features has increased the carrying limit from 230 to 300 tons per unit, overcome the restrictions imposed by lack of port cranage of this capacity, and largely done away with the previous limitations upon the use of sea carrying. It has enabled the bulk of the large loads to be taken off the roads for the major part of their journey, thus greatly relieving congestion and interference with other traffic.

In a foreword to this fascinating story Sir Stanley Brown, C.E.G.B. Chairman, pays tribute to the leadership of Robert Farrall, Chief Services Engineer, and his staff, in these developments.

Copies of the booklet are available from the Public Relations Branch, C.E.G.B., Sudbury House, 15 Newgate Street, London, E.C.1, or from provincial offices.

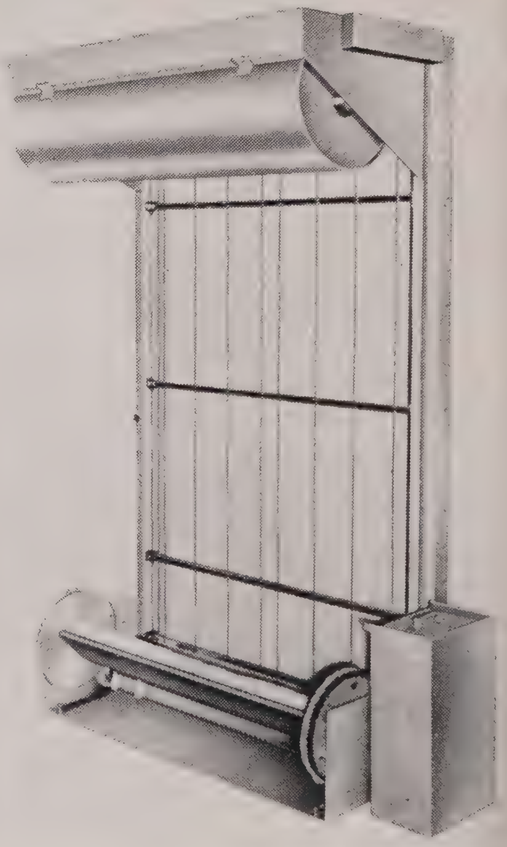
### Design Manual

A Design Manual for pre-balanced full central heating by the Halcyon Warm Air System has been issued, at one guinea, by William Sugg and Co. Ltd., at Manor Royal, Crawley, Sussex. It has been prepared for the use of staff involved in the design of pre-balanced full central heating systems in which the Sugg Halcyon warm air heaters are installed. The design method takes into account all the significant factors involved, and can be worked out easily and quickly. The heat required for each room is pre-balanced at the design stage and not by trial and error balancing of a completed installation.

### New Air Cleaning Appliance Factory

A new factory for the manufacture of a wide range of air cleaning equipment was opened by the Rt. Hon. George Darling, M.P., Minister of State, Board of Trade, at Cramlington, Northumberland, on 23 October. The firm is American Air Filter (Great Britain) Ltd., a subsidiary of American Air Filter Company of the United States.

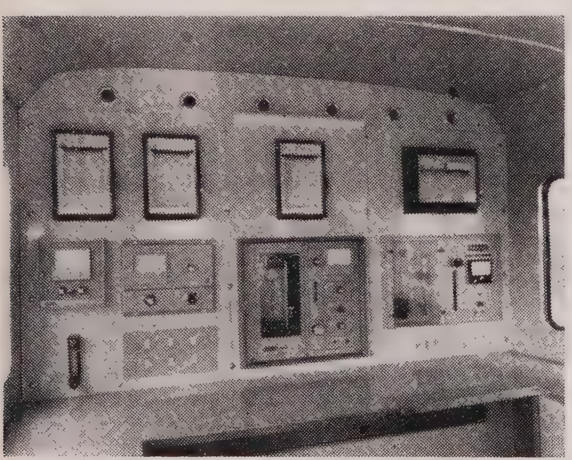
Mr. Darling, in his address, said that he was glad the factory had opened at Cramlington, which would be a good thing for the town, for the North East, and for Britain. In the past three years the Board of Trade had given the go-ahead to 700 sites for new factories and extensions in the northern region, providing nearly 60,000 new jobs.



*The "Roll-O-Matic" automatic renewable media air filter manufactured by American Air Filter (Great Britain) Ltd. Glass fibre filtering media is automatically fed down the face of the filter, and re-rolled at the bottom after it has accumulated its dust load. Under normal operation, media for a 10,000 c.f.m. unit will last one year.*

Many other guests were at the opening ceremony, which was addressed also by J. M. Shaver, Chairman of the parent company, at Louisville, Kentucky, and Dr. W. T. Cosby, Managing Director of the new British company.

In addition to a range of air filters, one of which we illustrate, the company manufactures air pollution control equipment, including dry centrifugal collectors, wet, fabric, and oil mist collectors.



*This mobile air quality laboratory, designed and equipped by Beckman Instruments Ltd., of Glenrothes, Fife, is being demonstrated at various centres in Britain to local authority officials and others concerned with air pollution problems. Equipped with analysers for measuring different types of pollution, it is able to track down air pollution to its source, and it has already completed a demonstration tour of Western Europe. Also shown is a view of the interior.*

To the Central Electricity Generating Board, smoke means more than impure air. It means unburnt carbon, wasted power.

At modern coal-fired power stations, over £3,500,000 is spent on clean air measures —tall chimneys and dust extraction plant.

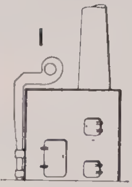
**Better — cleaner — things are electric**

# REFUSE REDUCTION
# *with* RILEY
# *Incineration Equipment*

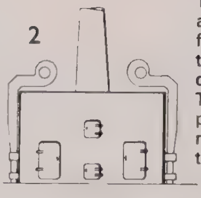
The Riley Refuse Reducer is available in two basic sizes :—

'Simplex' **(1)** capable of accepting ½ ton of refuse per hour.

'Duplex' **(2)** can accept up to 9 tons per 8 hours burning.

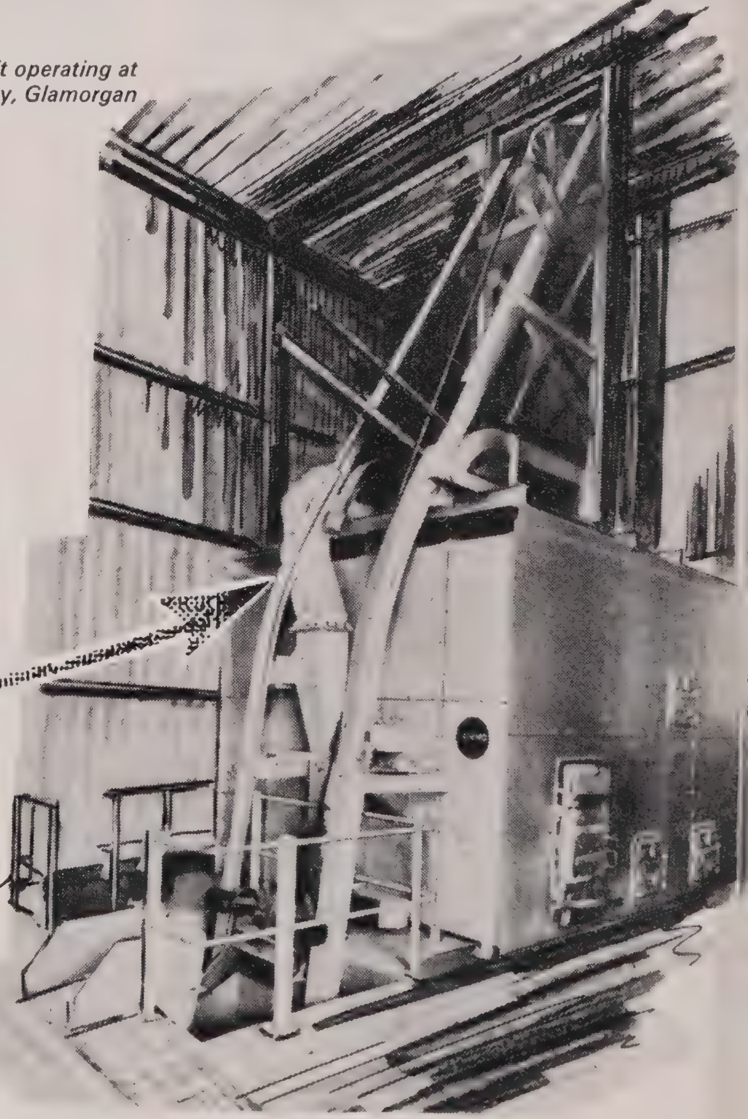


These burning rates are based on refuse having a density of 2½-3 cwt per cubic yard, with a calorific value of 4,000 Btu per lb.



The system allows for flexibility, as an initial unit can be enlarged for greater capacity by the addition of a secondary combustion chamber and forced draught fan. This equipment can also be supplied to suit individual requirements, not wholly covered by the two basic units.

*Illustrated is a 'Simplex' unit operating at Messrs. Midland Silicones Limited, Barry, Glamorgan*



This incinerator is provided with primary and secondary combustion chambers having controllable secondary air nozzles, the oil-fired heating medium is fitted with photo-electric control. Designed to burn 560 lbs per hour of waste containing silicone rubber, filter paper impregnated with varnish and often material soaked with white spirit.

The integral skip hoist is employed to charge the unit with this waste, and is fitted with the usual safety devices, limit stops ensuring positive clean tipping.

**Riley**

*The Incineration Engineers*

*Please write for illustrated technical publication R.6520 which is available on request.*

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*"And tis my faith that every flower enjoys the air it breathes"* WORDSWORTH

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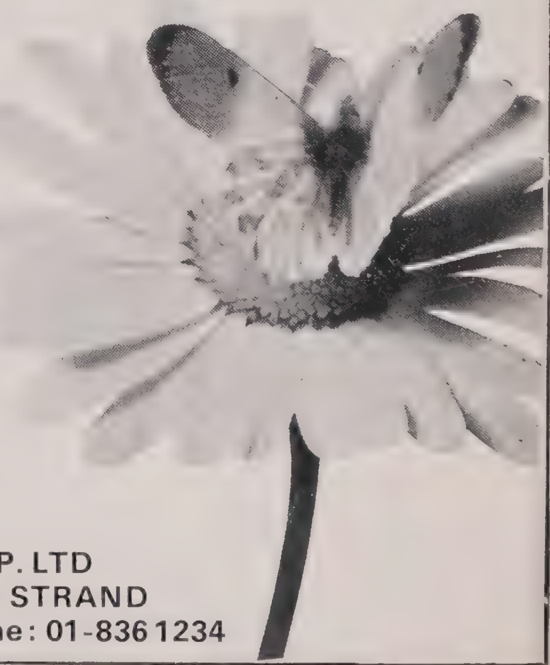

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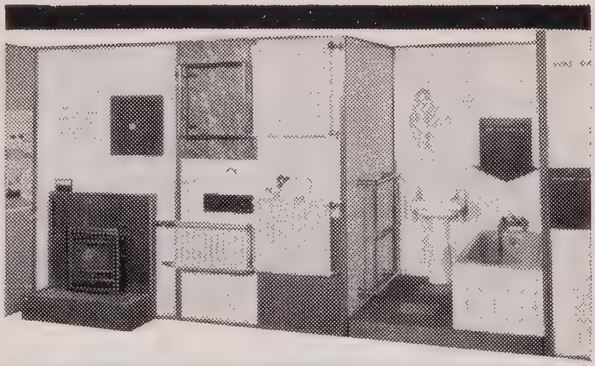
# More ammunition for clean air campaigns

**Local Authorities organising "Clean Air" campaigns, establishing Smoke Control Areas, organising House Improvement or Conversion schemes are invited to take full advantage of the services offered by the Solid Smokeless Fuels Federation, and available free of charge.**

## EXHIBITION

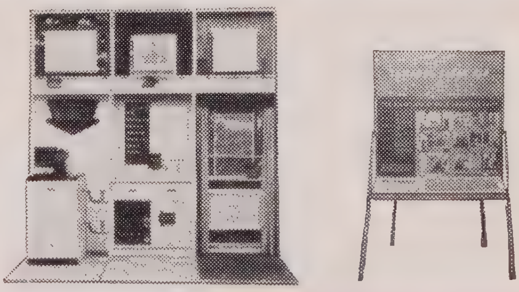


A complete pre-fabricated and self-contained "Clean Air" Exhibition: adaptable in size with one, two, three or four approved smokeless appliances under fire, and displays of the smokeless fuels available in the district.

## MOBILE UNITS

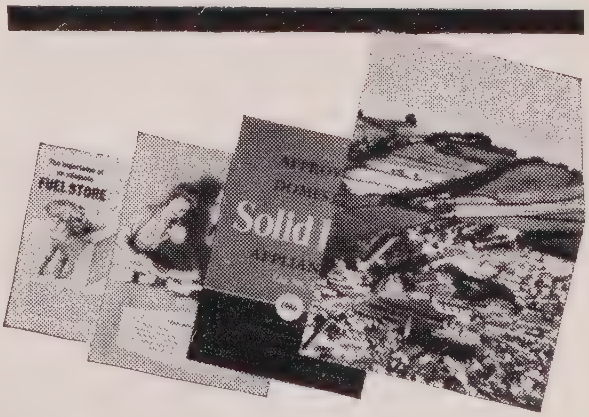
Manned with technical demonstrators, to advise and help residents in proposed or newly-formed Smoke Control Areas. They incorporate approved appliances under fire and a display of the solid smokeless fuels.

## DISPLAYS



A range of portable units variously displaying instructional panels dealing with Clean Air and the Act, a typical central heating unit, fuel displays and literature displays.

## LITERATURE



Informative literature is available free to Local Authorities explaining the Clean Air Act, and giving full information on solid smokeless fuels and the appliances.

*For full details of S.S.F.F. Services and literature apply to:*

**SOLID SMOKELESS FUELS FEDERATION,**
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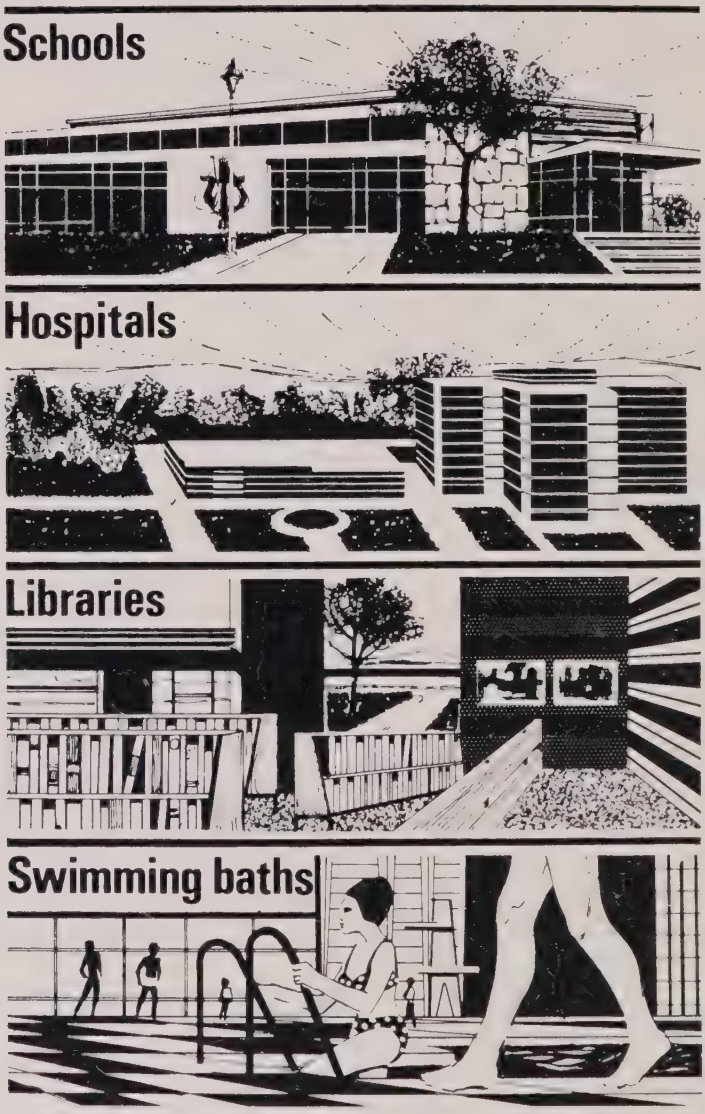

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# SMOKELESS AIR

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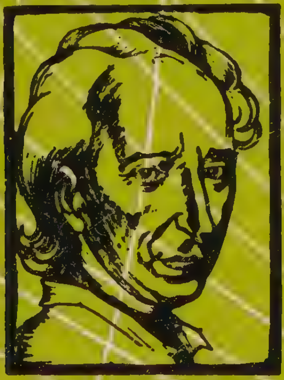
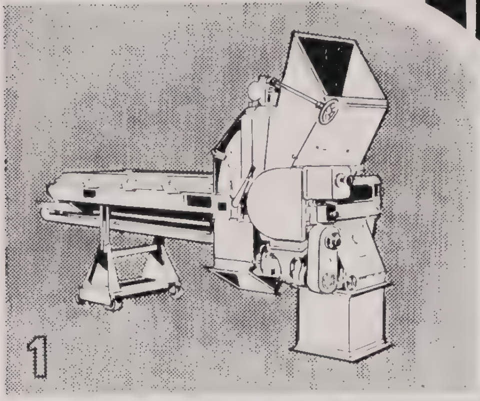


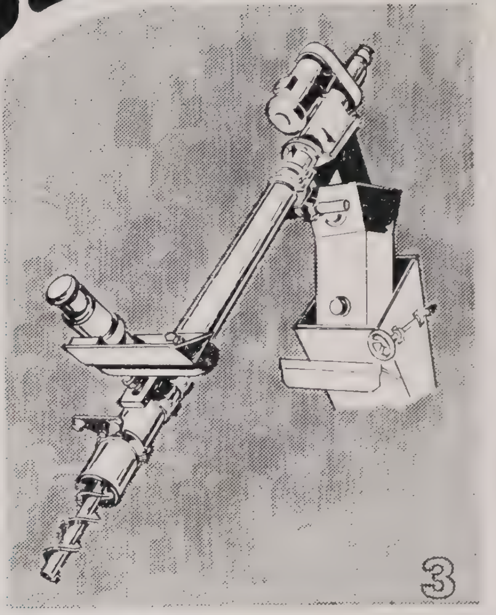
No. 145 ⋆ SPRING 1968 ⋆ 3s.

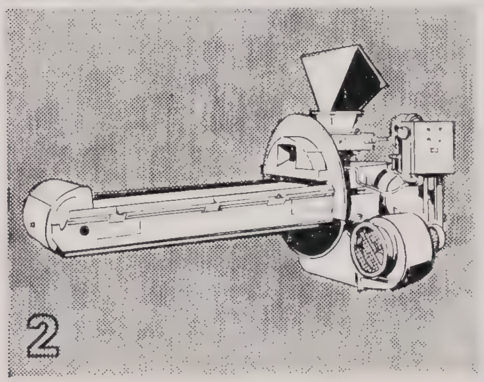
*In this Issue*

The New Clean Air Bill ★ House Martins and Lichens
Bedfordshire Brickfield ★ New Laws for Italy and U.S.A.
Rance Tidal Power Station ★ Northern Ireland Meeting

# A GUIDE TO MAXIMUM EFFICIENCY IN SOLID FUEL COMBUSTION







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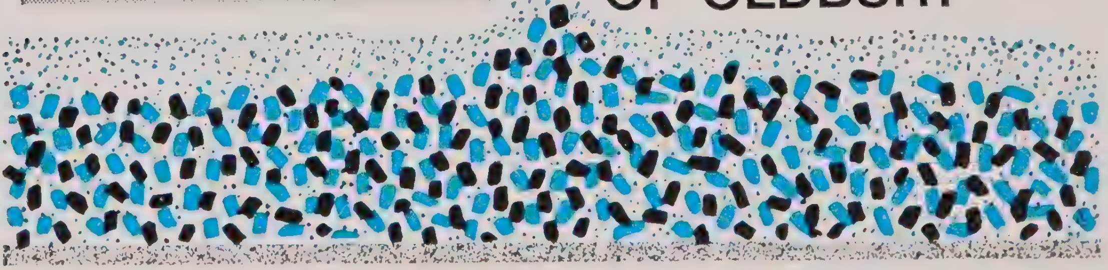

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To heat bigger rooms
Yet so efficient and so well designed
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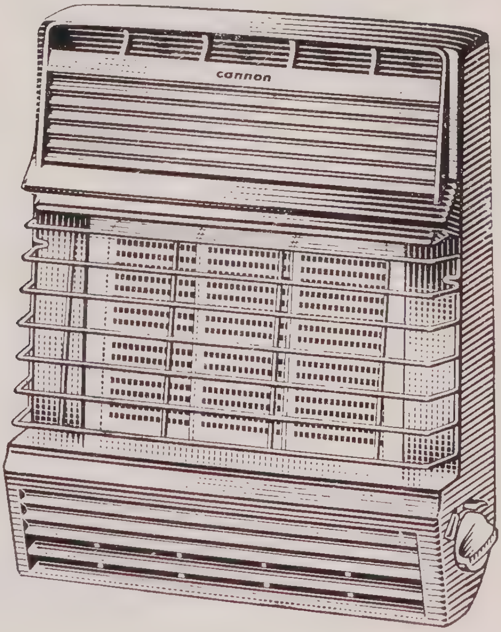

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'Simplex' (**1**) capable of accepting ½ ton of refuse per hour.

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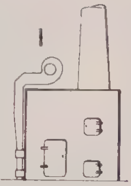
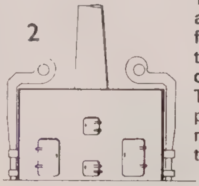


These burning rates are based on refuse having a density of 2½-3 cwt per cubic yard, with a calorific value of 4,000 Btu per lb.



The system allows for flexibility, as an initial unit can be enlarged for greater capacity by the addition of a secondary combustion chamber and forced draught fan. This equipment can also be supplied to suit individual requirements, not wholly covered by the two basic units.

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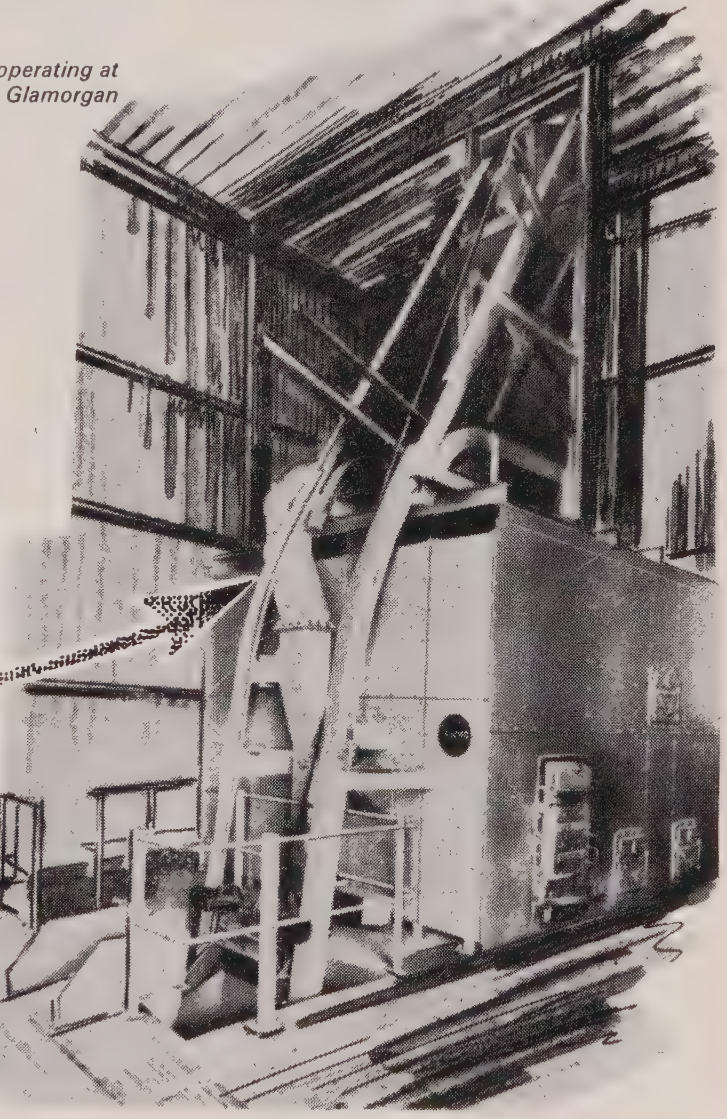

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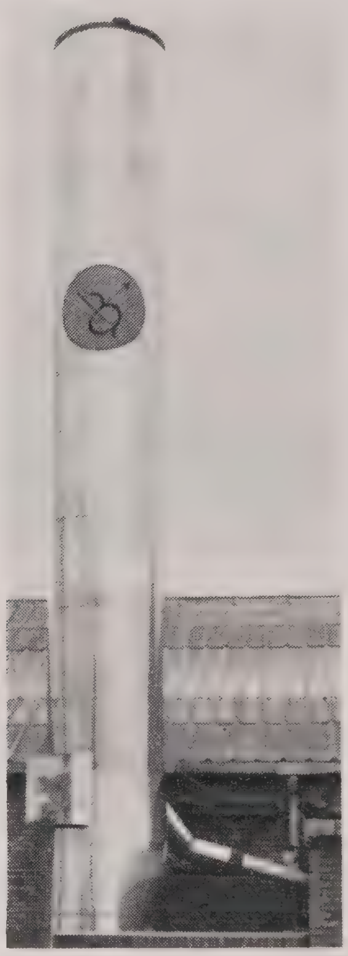

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## EXHIBITION

A complete pre-fabricated and self-contained "Clean Air" Exhibition: adaptable in size with one, two, three or four approved smokeless appliances under fire, and displays of the smokeless fuels available in the district.

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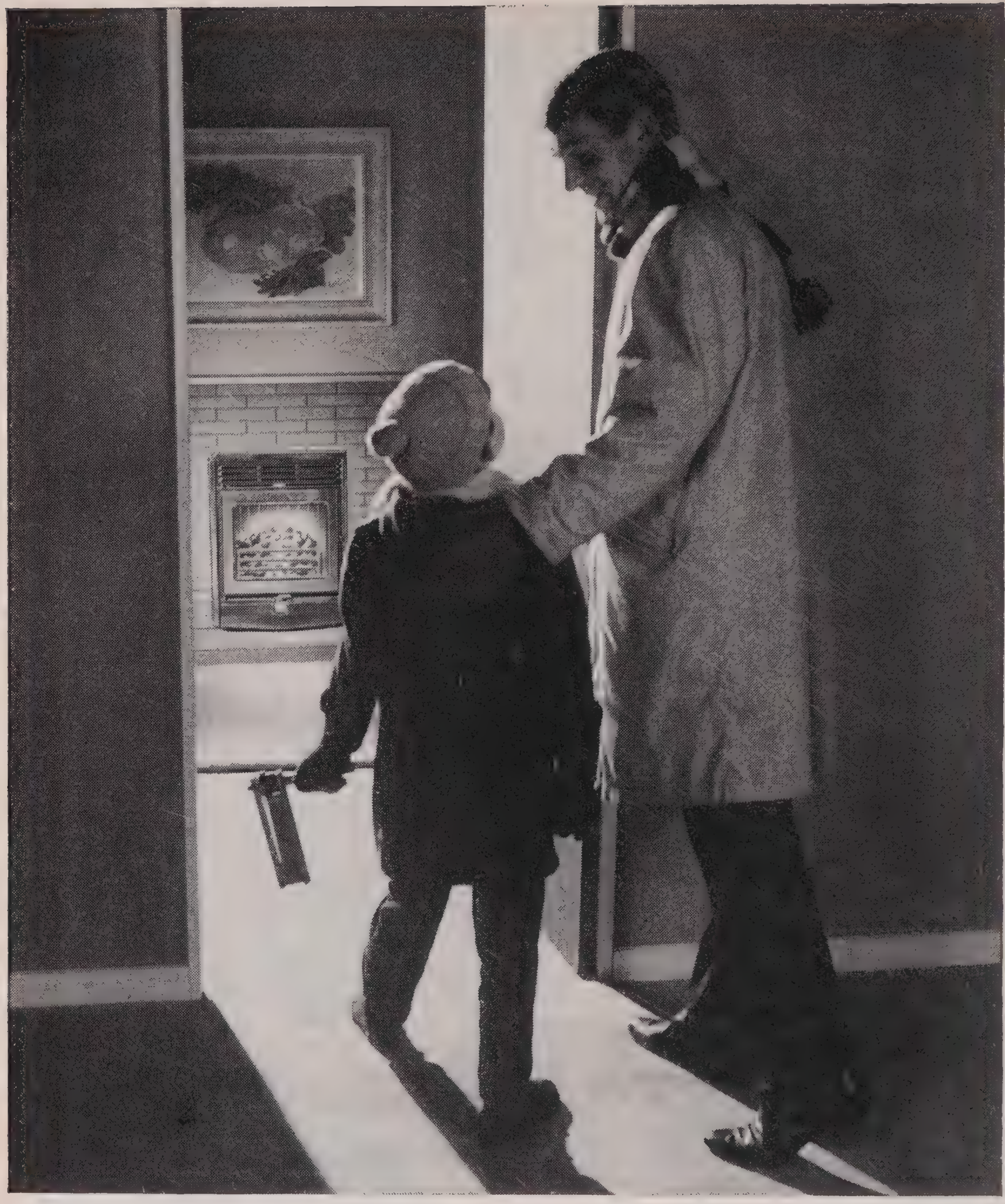
*For full details of S.S.F.F. Services and literature apply to:*

**SOLID SMOKELESS FUELS FEDERATION**

**York House, Empire Way, Wembley, Middx.**



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It costs so little to heat your home with solid smokeless fuel, especially when you consider the tremendous benefits it brings. Clean air, economy and cheap all-over warmth—all wrapped up in the luxury of a friendly living fire! There are so many different fuels to choose from that you're sure to find one that's exactly right for you. And with a modern solid fuel appliance you can obtain round-the-house warmth and constant hot water, too. Want to know more? Your nearest National Coal Board Regional Sales Office will tell you everything you want to know.

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THIS FIRE...

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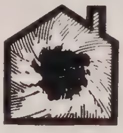
...SAVES THIS MONEY: £5 AT LEAST ON EVERY APPLIANCE

ON EVERY HOUSE...



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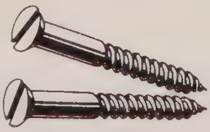

Yes, with just two screws, it fits any standard 16″ fireplace with or without a back boiler in one-eighth the time it takes to fit any comparable smokeless fuel burning appliance.

THE SECRET...

The FANTOM uses a built-in electric fan to stream air up through the fuel, noiselessly, continuously, controllably. Switch on, and all smokeless fuels burn brightly: to give a glowing, *living* fire.

FANTOM

the power behind the living fire

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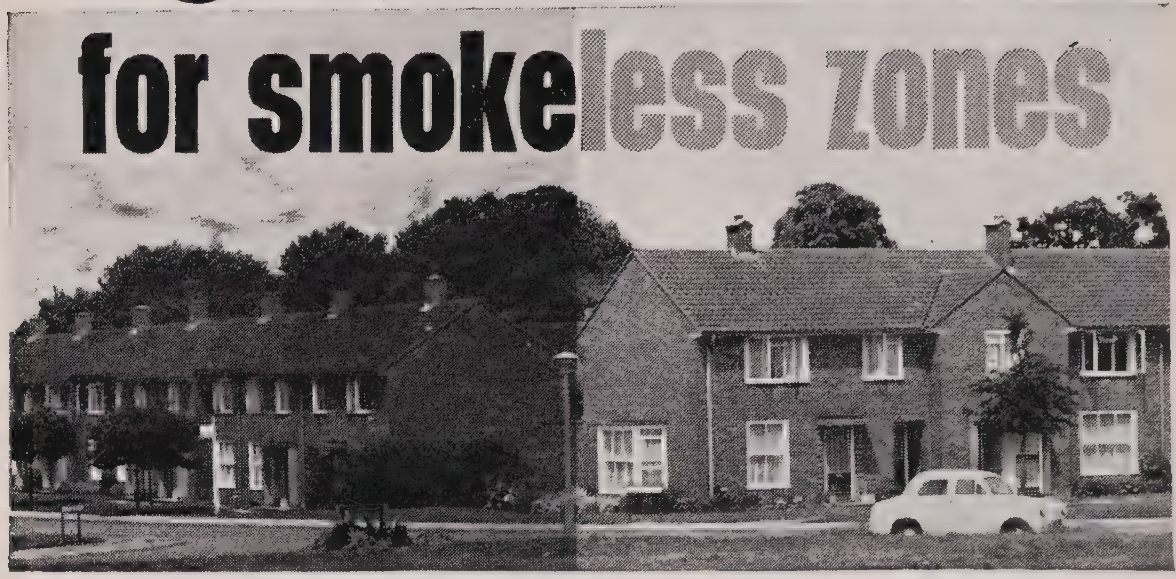
# Big news for smokeless zones



# Big increase in 'Coalite' supplies

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**THE MODERN SMOKELESS COAL**

# SMOKELESS AIR

Vol. XXXIX No. 145 Spring 1968

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: 01-242 5038 (Editorial and Advertising). Editor: Arnold Marsh; Asst. Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SKOKELESS AIR only, 12s. per annum, post free.

SMOKELESS AIR is the official organ of the Society, but the views expressed in contributed articles are not necessarily endorsed by the Society. Abstraction and quotation of matter are permitted, except where stated, provided that due acknowledgements, including the name and address of the Society, are made.

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**An NSCA Report**

3s. (3s. 4d. by post); 24s. per 10; £5. 10s. per 50; £10 per 100 (post free)

## Forthcoming Events

**Annual General Meeting; Open Meeting with Lord Kennet;**
**Annual Luncheon—London, 26 April** (*see page 155*)
**Annual Conference and Exhibition, Harrogate, 22-25 October** (*see page 199*)

*Ships, towers, domes, theatres and temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air.*

# SMOKELESS AIR

## *Welcome to the new Bill*

On 16 February the new Clean Air Bill, at the third attempt, received its second reading in the House of Commons. After the first two occasions, when the cry of "Object!" was raised by an unnamed voice, serious apprehensions were growing in clean air circles. But it is now on to the committee stage, and is a bill to be welcomed and supported. It may not contain everything that everyone would like, but it does include as much as is wise and practicable for a private member's measure.

The domestic smoke clauses are perhaps the most important, and will please many local authorities and others. It will be possible to require smoke control programmes to be undertaken in designated areas, which means that the laggards will have to fall into line; and there is the prohibiting of non-authorized fuel to be acquired or sold for delivery in smoke control areas—a step that has been increasingly demanded in recent years.

On the industrial side there are also important changes. There is the closing of the odd gap in the 1956 Act, so that it will be possible to control dark smoke even it it is not coming from a chimney; and there is also the lowering of the minimum size of plant required to be fitted with grit arrestors. The figure proposed is 100 lb. per hour in place of 1 ton per hour.

Some shortcomings in chimney height control are sought to be remedied, mainly by the inclusion of the hitherto exempted residences, shops and offices, excepting only small domestic installations of under 55,000 Btu/h.

Also we are glad to see there is provision for dealing with objectors to smoke control by hearing them individually instead of through public inquiries with all the delays and expense to the community that these create.

We hope the Bill goes through its committee stage safely and without it in any way being weakened. An outline of its provisions is given on another page, and we also report in full the second reading debate.

## *Fuel Policy*

The White Paper on Fuel Policy, published in November last, was received too late for mention in our last issue, and by now it will seem to many to be old news. But it needs to be noted in a journal devoted to air pollution, even though this is a matter not directly referred to in the report. Its findings are however of concern to the clean air movement because they show that, despite the profound changes that are taking place in the development of Britain's energy sources, there will be dependence for many years to come on fuels that, if not used under correct conditions, could continue to pollute the air unnecessarily.

The White Paper recognizes that we are entering an era based on four primary sources of energy: coal, oil, natural gas, and nuclear and hydro electricity. The chart from the report that is reproduced (with a summary of the report's conclusions) on page 165, clearly shows the anticipated trends. A diminishing use of coal, some increase in the use of oil, and marked increase in the use of natural gas and hydro and nuclear electricity, will be noted. But it will also be seen that, up to 1975 and obviously beyond then, the last two account for only about one quarter of our total energy requirements. Although the changes that are expected, and the rate at which they occur, may vary in detail as time goes on, the main pattern is not likely to alter, and therefore it is necessary for clean air policy to be based upon this pattern. That is, for a number of years to come, a decade or more, the greater part of our energy will come from sources that may give rise to smoke and grit emission, and will certainly give rise to sulphur dioxide. Natural gas and nuclear energy, although their promise is great, cannot revolutionize the situation within this period.

It is therefore essential to continue to see that the Clean Air Act is implemented as effectively as possible, to demand that the best available methods be used to minimize the effects of sulphur dioxide, and above all to press on more vigorously with the elimination of the major source of smoke—the domestic fire.

## Domestic Fuel Policy

The White Paper was concerned with the prospective balance between the primary fuels as they are being affected by major developments. Other aspects of fuel policy, mainly concerning the secondary fuel industries, it is said in the report, are being studied separately. Some of these are likely to concern clean air policy more directly, especially in the still vexed question of which fuel, if any, to favour for domestic smoke prevention. This bears on the discussion usefully raised by the suggestion made by A. R. Smith in his paper at the Blackpool conference, that among matters for debate should be whether the trend away from solid fuel for domestic purposes should be encouraged (to reduce sulphur dioxide pollution) by prohibition of its use in new housing and new smoke control areas.

Although Mr. Smith said that this was one of several suggestions thrown out for discussion, it was enough to cause a ridiculous panic-stricken reaction in two of the coal trade journals, which blamed the Society for allowing such a heresy to be voiced. They can rest assured. Even though we have no intention of gagging conference speakers, the Society's collective thought shows no signs of moving from the belief that the smoke control programme needs solid smokeless fuels as much as it needs the other sources of energy.

The White Paper, and the figure from it that we reproduce, shows clearly that there must be dependence on coal and coal-based fuels to a very large extent for years to come. To complete the smoke control programme —still with two-thirds of its way to go —there is a need for all four of the alternatives that are available: solid smokeless fuel, gas, electricity, and oil. Without any one of them, for a variety of reasons, progress would become more difficult and the already slow progress would become still slower.

One anxiety is, in fact, the slow progress in filling the solid smokeless fuel gap left by the run down of gas coke. Thus the recent report of the Domestic Coal Consumers' Council* voices this by saying: "We still have grave fears that the phasing out of gas coke manufacturer may not be adequately matched by increasing availa-

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* Industrial Coal Consumers' Council and Domestic Coal Consumers' Council. Annual Reports for the year ended 31 October 1967. H.M.S.O. 1s. 9d. net.

# Clean Air — Where Now?

**Is the title of the address to be given by the Rt. Hon. Lord Kennet, M.P., Parliamentary Secretary, Ministry of Housing and Local Government, and Acting Chairman, the Clean Air Council, at the Open Meeting following the Annual General Meeting.**

**Connaught Rooms, Great Queen Street, London, W.C.2., at 12.00 noon on Friday, 26 April, 1968.**

**Following the meeting Lord Kennet will be the Principal Guest at the Society's Annual Luncheon, also at the Connaught Rooms, 12.30 for 13.00 hrs. Tickets: 35s. each.**

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bility of other suitable solid smokeless fuels, and that the absence of real problems over the last two winters may have been primarily due to mild weather".

What we are in particular looking forward to, or hoping for, is news that the excellent new solid smokeless fuels being developed by the National Coal Board, in the face apparently of numerous technical hitches, can at last be produced in abundant quantity. If the table of coal and smokeless fuel consumption, by regions, given on another page, is examined, it will at once be seen that the needs in the north and midlands, and above all in Scotland, are great.

## NaSCA?

The Publicity Committee is considering whether it would be of advantage to the Society to have a new emblem. John Evelyn's portrait, it has been suggested, has served its purpose and is looking a little old-fashioned, and that something more in keeping with modern design, direct and simple, would have more impact. Faced with our old problem of symbolizing the invisible, clean air, the simplest of all would be just the letters NSCA in distinctive lettering and frame. The recent change of badge for the AA is pointed to as an example of such change. One step further would be to introduce a vowel, to give NaSCA, analogous to the well-known RoSPA, which would give a pronounceable short name. There is no doubt that a diminutive for informal use—two syllables as against ten—does help in communication and reference.

There seems much to be said for this though on the other hand there are those who feel that initials for organizations are too much with us and have become confusing. The Committee would be helped if it could have the views of members and other readers—that is your views, and any suggestion, on both the emblem and the NaSCA proposal, would be welcome and are invited.

## Enter Sex

A U.S.A. allergy expert, Dr. Frank Rosen, is reported to have said that Californian tests have shown that car exhaust fumes diminish the sex powers of animals. "As far as I know", he said, "research has not been carried out on human beings—but the possibility of the adverse effect is certainly there". Dr. Rosen thinks that this linking of smog and sex "might open some eyes." We agree that it might, but remain a little uncertain whether it makes good propaganda for clean air or the reverse.

# THE NEW CLEAN AIR BILL

## *Outline of its Provisions*

The new Bill, presented by Mr. Robert Maxwell, M.P. for Buckingham, has the full support of the Government, through the Ministry of Housing and Local Government. It is a most useful extension of the original Clean Air Act of 1956, and meets many of the proposals that have been made for new legislation that have been made in recent years, and which have been backed by the Society. It is therefore hoped that the Bill will go through its remaining stages without any serious revision. It completed its second reading on 16 February, and is now in the Committee stage. A report on the debate is given on another page.

Following is a short account of the main provisions of the Bill. It should be kept in mind that any attempt to summarize or describe in outline carefully constructed legal clauses involves the loss of detail and precision that may be important.

The Bill contains four main, and one supplemental, parts, with 13 clauses. The matters mainly dealt with are dark smoke; grit, dust and fumes; smoke control areas; and Alkali &c. Works.

### Industrial Clauses

*Dark Smoke* (*Clause 1*). This fills an important gap left by section I of the 1956 Act, which is concerned only with smoke emitted from a chimney. The new clause controls smoke from industrial and trade premises other than that from a chimney—frequently from the burning of waste material. The clause is similar to the powers already obtained in county Acts obtained by Middlesex and the West Riding of Yorkshire.

*Emission of Grit, Dust and Fumes* (*Clause 2*). This part of the Bill contains some important revisions of the corresponding sections of the 1956 Act. It replaces section 5 of that Act, which required the emission of grit and dust to be minimized. It states that the Minister may make regulations prescribing limits on the quantities of grit, dust and fumes that may be emitted. An important change is the inclusion of the word *fumes*, which in the interpretation clause is defined as "any airborne solid matter smaller than dust". As before, the control does not apply to domestic furnaces of less than 55,000 Btu/h. A "best practicable means" defence is allowed, and there are penalties up to £100 for offences.

*Grit and Dust Arrestment Plant for New Furnaces* (*Clause 3*). This extends the obligation under section 6 of the 1956 Act to fit plant for arresting grit and dust. Instead of the section applying only to furnaces burning pulverized fuel, or other solid fuel at a rate of *one ton per hour* or more, it is applied to pulverized fuel, other solid matter at a rate of *100 lb. per hour* or more, and also any liquid or gaseous matter burning at a rate equivalent to 1¼m. or more Btu/h. This clause runs to nine sub-clauses.

*Measurement of Grit, Dust and Fumes* (*Clause 4*). This amends and extends section 7 of the 1956 Act. Regulations may be made for furnaces as referred to above, but in the case of smaller furnaces, namely those which burn less than one ton of solid matter per hour, or 28m. Btu/h. of any liquid or gaseous matter, it is laid down that the occupier of the building may request the local authority to make the necessary measurements of dust, grit and fumes. It is also provided that a local authority may be represented when measurements are made by the occupier.

*Height of Chimneys* (*Clause 5*). Section 10 of the 1956 Act is completely replaced by the new clause. Instead of reference to the approval of a chimney shown in plans submitted for approval of new premises, the new clause requires any new chimney, other than one in exempted premises, and any existing chimney serving a furnace the capacity of which is increased, to be subject to the approval of the local authority. Section 10 of the 1956 Act exempted residences, shops and offices, but the new clause exempts such premises only if no furnace is used that exceeds the kinds and amounts of fuel laid down in Clause 3.

## Smoke Control Areas

The most important amendments are made to the 1956 Act in this part of the Bill.

*Powers to require creation of Smoke Control Areas* (*Clause 6*). This provides that where, after consultation, the Minister or appropriate Secretary of State is not satisfied that a local authority have been making sufficient progress on smoke control, he may require them to submit proposals for making orders. On approval of the proposals the local authority will be under a duty to carry them out. If an authority fail to submit satisfactory proposals the appropriate Minister may make a default order directing them to make orders for smoke control in accordance with the direction.

*Unauthorized Fuel* (*Clause 7*). Under the 1956 Act it is not an offence to buy and use unauthorized fuel (i.e. bituminous coal) in a smoke control area, nor is there any offence in the sale of such fuels. The only offence has been the emission of smoke from a chimney. Under the new clause it is made an offence to acquire unauthorized fuel for use in a smoke control area (except for use in exempted buildings or furnaces) or to sell such fuel by retail for delivery in a smoke control area.

*Procedure* (*Clause 8*). A number of minor amendments are made in respect to the procedure for making orders connected with smoke control areas. A useful change is that where there is an objection to a smoke control order the Minister may *either* cause a local inquiry to be held, *or* "afford to any person by whom an objection has been duly made . . . an opportunity of appearing before and being heard by" a person appointed by the Minister for the purpose.

*Alkali &c. Works* (*Clause 9*). This substantially exempts from the provisions of the 1956 Act and of the present Bill premises which are, or upon completion will be, controlled under the provisions of the Alkali &c. Works Regulation Act 1906.

Finally, clauses 10 to 13, together with two schedules, deal with supplemental matters, including procedure for exercising regulation-making powers, interpretation and repeals.

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## New Towns Come of Age

To celebrate the 21st anniversary of Britain's new towns the Town and Country Planning Association has published a special number of its journal under this title. With 136 pages for 7s. 6d. the special issue is very good value and is well produced. It contains numerous articles and reviews of progress with the new towns, and includes statistics, not available elsewhere, compiled from information supplied by the development corporations. An admirable production, on which we warmly congratulate the T.C.P.A.

## BLACKPOOL CONFERENCE PROCEEDINGS

**The final volume of Proceedings of the Society's 1967 conference is now being published. Conference delegates will be receiving copies direct, and others may be purchased at a price of 30s. each, postage included.**

# THE CLEAN AIR BILL

## *Full Report of Second Reading Debate, 2 February, 1968*

**Mr. Robert Maxwell** (Buckingham): I beg to move, That the Bill be now read a Second time.

Before commending the Bill to the House, I should like to thank those right hon. and hon. Members of all parties who have lent their names as sponsors to this, in principle, uncontroversial and urgently needed measure. I should also like to thank the Government for the assistance they have given me in bringing the Bill to this stage. I should like also to give a brief background introduction to the Clean Air Act, 1956.

The father and inspirer of the Clean Air Act was the hon. Member for Worcestershire, South (Sir G. Nabarro). He originally introduced it as a Private Member's Bill. The right hon. Gentleman the Member for Streatham (Mr. Sandys), then Minister of Housing and Local Government, and the right hon. Gentleman the Member for Ashford (Mr. Deedes), then Parliamentary Secretary to the Ministry, took over the Bill and introduced it as a Government-sponsored Measure in the spring of 1955.

The Bill got as far as the Committee stage but then the 1955 General Election intervened. However, it was reintroduced afterwards and seen through all its stages—I am happy to say, unopposed. My hon. Friend the Member for Widnes (Mr. MacColl), now Joint Parliamentary Secretary to the Ministry of Housing and Local Government, together with Dr. Edith Summerskill, as she then was, speaking for the Opposition, handled the passage of the Act on a non-party basis and, I believe, contributed to improving it and getting it on to the Statute Book. In 1965, my hon. Friend the Member for Bilston (Mr. Robert Edwards) had the rather sad experience of introducing the Clean Air (Further Provisions) Bill, which, regrettably, could not be taken owing to lack of Parliamentary time. This Bill has been prepared in the light of over ten years' experience in the working of the 1956 Act.

In moving the Second Reading of the Bill, I suggest that much of what it contains are matters of common sense in the present context and likely to be agreed in their intention by all concerned. Some of its provisions were the subject of discussion in Committee some 12 years ago, and it is natural that some points which were then not thought to be so important now seem to be valuable improvements in order to make that Act fully workable and applied. The Bill is necessary. It is not simply a bit of administrative tidying up. The coal merchants, the C.B.I., the National Coal Board and many other interested organizations have given the Bill a ready understanding and in general are in agreement that it is not a harassing Bill. Least of all is it meant to be a harassing Bill for industry, which has done so much to implement the previous Act. It is from the domestic chimney that four-fifths of all the smoke in Britain comes, and much of this need not be.

I understand from an hon. Member that the building industry may feel somewhat concerned about some of the provisions of the Bill. I give an undertaking that in Committee we would meet any of their reasonable objections or changes that they have in mind. I am not bringing the Bill forward on a take-it-or-leave-it basis.

I should like to put the Bill in its proper context of 1968. As populations increase, as densities in this crowded Island increase, as we look forward to the age dealt with in the Buchanan Report, and above all as the scientific exploitation of the world's resources continues, the care with which we treat our atmosphere and environment becomes more and more vital. I should like to quote from an editorial of the *New Scientist* which deals with that very problem. It stated that at the last annual meeting of the American Association for the Advancement of Science, a leading American scientist, Professor Cole, of Cornell University.

> "challenged the comfortable assumption that the world's supply of oxygen is permanent and inexhaustible. He pointed out that . . . oxygen 'would quickly disappear from the atmosphere if all the green plants should be killed'. And that, said Dr. Cole, is exactly what man is now engaged in doing . . . 'Grassland is being paved at about a rate of one million acres a year, thus removing oxygen from the air that would otherwise have been put into the atmosphere by photosynthesising green plants'. A point could be reached where the rate of consumption exceeds the rate of photosynthesis, and the oxygen content of the atmosphere would then decrease. 'Indeed' said Dr. Cole, 'there is evidence that it may already be declining around our largest cities like New York and Philadelphia'."

The Bill has had a good Press from responsible journals watching these matters. They are aware that we still have a long way to go and that only 43 per cent of the black areas are covered by Clean Air Orders.

I should like to give a few examples of the excellent work which has been achieved by the Clean Air Act, 1956, for instance on smoke reduction. The following are figures for smoke emission in Great Britain in 1956 and 1965, I am talking about the smoke emitted in millions of tons. In 1956 the figure for domestic smoke was 1·27 and in 1965 it was 0·90—a reduction of 30 per cent. On the industrial side, 730,000 tons of smoke were emitted in 1956, but only 190,000 tons in 1965—a remarkable reduction of 74 per cent which probably accounts for the London smog from which we have suffered in the past being much less seen.

The London smog in 1952 killed an estimated 4,000 people: that of 1956 killed 1,000 people. In December 1962, in conditions identical to those of 1952, the estimated number of deaths was 750. There has not been any serious smog in London since 1962, which is undoubtedly due to the effect of the excellent 1956 Act.

What about smoke control? Up to 31st December, 1967, a total of 3½ million premises in England had been covered by smoke control Orders. Such Orders now control 43 per cent of premises in "black" areas. In London, the figure is 65 per cent—a remarkable achievement.

What about grit and dust? The 1956 Act required that grit and dust from existing solid-fuel-fired industrial furnaces should be minimized, and that new furnaces of this kind should be fitted with arresters. Dispersion of grit and dust is dependent on weather conditions, which vary from one year to another, but there has been a definite underlying downward trend since 1957. According to the Warren Spring Laboratory of the Ministry of Technology, there was a decrease in pollution by grit and dust at industrial sites from an average of 310 microgrammes per cubic metre in 1957 to 230 micrograms in 1964-65—a net reduction of 26 per cent.

Before explaining briefly what the 1956 Act did and what the new Bill would do, I should like to give the House a brief background. The Industrial Revolution, amongst its other effects, gave rise to increasing problems of air pollution, not only from industrial works but from the houses of a greatly increased town dwelling population. The Victorians became used to urban fogs, expecially in winter, and there are many contemporary references to the so-called London "particular"—as, for example, in "Bleak House" and the "Forsyte Saga". Those fogs were due to dirty air caused largely by the domestic chimney as well as by industry. Industrial pollution was first tackled in 1862 by the original Alkali Act, which had several successors.

Between the two world wars, one or two cities created smokeless zones under local Acts, but it was not until the disastrous smog in London in 1952—which, as will be remembered, lasted for about four days—that general legislation for clean air was considered. The Beaver Committee, set up as a consequence of the 1952 smog, reported in 1954, and on its Report was based the Clean Air Act of 1956. I believe that the hon. Member for Worcestershire, South (Sir G. Nabarro) would agree that the Beaver Committee did a great deal of useful work.

The Clean Air Act, 1956, gave local authorities control over emissions of smoke, grit and dust by industry. It also conferred power to deal with domestic smoke. There can be no doubt that the 1956 Act has made a great deal of difference on a national scale to the cleanliness of the air and to the improvement of the environment in the conurbations generally. Industrial smoke has been reduced by 75 per cent and domestic smoke, although it now constitutes 80 per cent of the smoke emission over the country, has also been appreciably reduced. Some 43 per cent of premises in black areas—industrial areas and conurbations scheduled as having a particularly heavy incidence of air pollution—has at present been covered by smoke control orders. Although progress has not been so fast as the Beaver Committee hoped and expected anyone who is old enough to remember conditions 20 years ago has only to look around in London or to visit a city such as Sheffield to see the change.

We have had more than 10 years' experience of operating the 1956 Act. It is a good Act but it could be better. It could fling a wider net and cover certain things it does not cover and confer wider powers on local authorities and the Minister. Also during the last 10 years techniques of controlling air pollution have advanced. The time is ripe to take a step forward and also to take the opportunity to tidy up the 1956 Act and remove one or two minor anomalies. The main objects of the Bill, on the industrial side, are to empower the Minister to prescribe limits on the level of grit, dust and fumes to be emitted. This is covered in Clause 2. Secondly it should extend to a range of furnaces wider than is caught by the 1956 Act, the obligation to install plant to arrest grit, dust and fumes. That is dealt with in Clause 3.

**Mr. A. P. Costain** (Folkestone and Hythe): The hon. Member knows that I have indicated some trouble about this Bill, although I accept it in principle. Will he say a word about Clause 1? I have some hesitation about Clause 1 and the definition of premises. What is the definition where a contractor is burning asphalt on the road? Is that excluded from the Bill?

**Mr. Maxwell:** That is excluded, most definitely. I am not putting forward the Bill on the basis of take it or leave it. There is an enormous amount of room to improve it in Committee, but I am glad that the hon. Member accepts it in principle.

**Mr. Costain:** I have some other points.

**Mr. Maxwell:** If the hon. Member will raise them, I shall be glad to give way.

The Bill would substitute for the present unsatisfactory system a new system of control by local authorities over industrial and other chimney heights. There is power to prohibit emission of dark smoke from industrial or trade premises otherwise than from a chimney. Emission from a chimney is already controlled in Clause 1.

On the domestic side—

**Mr. John Wells** (Maidstone): Would the hon. Member be prepared in Committee to accept phraseology providing particularly that horticultural glasshouse chimneys be excluded?

**Mr. Maxwell:** I see no reason in principle why not.

The Bill would give the Minister power to direct local authorities to submit programmes of smoke control and require them to carry them out. This would be used for cases where the Minister was satisfied that an authority had not been exercising powers of smoke control sufficiently in spite of grave local need as specified in Clause 6. It will make it an offence to deliver or buy solid smoke-producing fuel for consumption on premises subject to a smoke control order as in Clause 7. Other minor provisions are dealt with in detail.

Possible objections to proposals embodied in the Bill have been discussed, among others, with the local authority associations, the Confederation of British Industry, the National Coal Board and the Coal Merchants' Federation. They have received the approval of the Clean Air Council. It is thought that there is unlikely to be opposition to the principles of the Bill from those or any other influential quarters. However, if there should be I wish to make clear that no one is forced to take or leave the Bill as it stands on Second Reading. Reasoned Amendments to improve it in any respect will be welcomed and will be treated on their merits. As time is getting short, I will gladly give way to the hon. Member for Folkestone and Hythe (Mr. Costain) if he wishes to raise any other points.

**Mr. Costain:** There is one other outstanding point which causes me some concern. Would the hon. Gentleman explain why he is giving the Minister power to alter these Regulations further? Surely, after 10 years of experiment with the first Act it should not be necessary to give this power to the Minister? We on this side of the House object to having legislation from outside Parliament. Will the hon. Gentleman give an assurance that he will have this Clause removed?

**Mr. Maxwell:** I should not like to give such an assurance. I should like to explain why the Clause will be valuable. If the Minister did not have these powers we might be forcing local authority to implement the measure at a time when it was inopportune or when the local authorities did not have the means to do so. I certainly assure the hon. Gentleman that if he fears that the Minister is likely to use these powers in any way detrimentally, my understanding from discussions that I have had with the Minister is that these powers would be used only as a last resort. I wonder whether the Minister would like to say anything on this point by way of intervention?

**The Joint Parliamentary Secretary to the Ministry of Housing and Local Government (Mr. James MacColl):** I warmly welcome the Bill. As my hon. Friend has said, we can consider at leisure in Committee any point which may be raised, and I am sure come to a fair and dispassionate decision upon it.

**Mr. John Hall** (Wycombe): I should like to raise a point on Clause 7 and the powers which are vested in the Minister thereby. May I point out that it has been quite impossible to create a smokeless zone in some areas?

**Mr. Maxwell:** I am quite sure that my right hon. Friend has no intention of using these powers unreasonably. I would certainly use whatever influence I have to ensure that the Bill is so worded that the Minister cannot use his power in an unreasonable way.

**Mr. Stan Newens** (Epping): May I draw attention to a point on Clause 5? It provides for the control of chimney heights and gives powers to local authorities. May I point out that a very important element in the control of atmospheric pollution is the fuel which is burned at the base of the chimneys. Will my hon. Friend take that into account in the Committee stage so that some control is given over the nature of the fuel which it is proposed to use?

**Mr. Maxwell:** I certainly give the assurance that that matter will be taken into account in Committee.

There is a new principle in this Bill on planning which I hope will commend itself. In the case of a planning application which does not receive approval because the local authority takes a long time considering it, when chimney heights are involved, I am proposing to put in the Bill a provision whereby if the local authority does not deal with the application within 60 days the application is automatically granted.

I should now like to commend the Bill to the House.

**Mr. Costain:** As I explained earlier, I do not think this Bill has had sufficient time for debate. I told the hon. Gentleman that I support the Bill in principle and I should like to see it become law. There is, however, a fundamental disagreement on the rights of the Minister and I should like to give the Minister an opportunity to intervene on this point.

**Mr. Maxwell:** I would gladly support that invitation to my hon. Friend to intervene.

**Sir Gerald Nabarro** (Worcestershire, South): As the author of the original legislation, I should like to add a sentence. This Bill is very welcome and, at a distance of 12 years, we have learned a great deal about smoke legislation and the control of fumes. I give the Bill my utmost support.

**Mr. John Wells:** I am grateful to the hon. Gentleman for the assurance he has given about horticultural chimneys. I do, however, have a certain slight doubt about a Private Member's Bill—

*It being Four o'clock, the debate stood adjourned.*

*On 16 February the Bill received a Second reading without further debate and was committed to a Standing Committee.*

STUBBLE BURNING

*The Society is looking into the extent to which nuisance is caused by the practice of burning stubble, near houses and roads, and particularly close to smoke control areas. Above is shown a typical example. Any evidence from readers on this question will be welcomed.*

# BEDFORDSHIRE BRICKFIELD

## *Report and Conference*

Bedfordshire has one of the country's major brickfields, producing 20 per cent of the total output of bricks in Britain, and 45 per cent of flettons. The brickfield, with seven active workings, and a number that are disused, lies in an almost straight S.E.-N.W. line near the middle of the county. The industry creates a number of difficult problems, air pollution among them. It has recently been surveyed in an excellent report *Bedfordshire Brickfield* by Geoffrey Cowley, the County Planner of the Bedfordshire C.C.,* and was also the subject of a special conference, convened by the County Council, in Bedford on 8 January last.

The nature and extent of the problem can be seen from the chapter headings of the report. After describing the area affected, and the brick industry itself, the report considers restoration and landscaping; air pollution; agriculture, trees and the landscape; population, settlement, and communications. It then looks at the future—rehabilitation and reclamation.

At the conference, to which interested outside bodies and the press had been invited to be represented, it was clear that the main problem causing concern was the harm done to the amenities of the area and the effect upon the landscape. Air pollution, apart from a contribution from Dr. Craxford, was given very little attention, and it is to the report that one must turn for an appraisal of this problem.

There are 111 chimneys in the brickfield, dominating a landscape that is largely flat and treeless—"an alien feature in a basically rural setting".

The heights of the chimneys range from a little over 100 ft. to about 230 ft., and there is a trend towards taller chimneys as being the most effective way of dealing with the pollution. Planning permission for a new brickworks near Woburn Sands includes a condition requiring the chimneys to be at least 300 ft. high.

It is pointed out that the S.W.-N.E. orientation of the workings and the prevailing south-west winds would seem to make ideal conditions for an abnormal build-up of pollution.

The pollution experienced falls into two groups: the sulphur dioxide and fluorine compounds that may be a hazard to human and animal health and may affect tree growth; and that which gives an offensive but harmless "rubbery" odour. The latter pollutants are thought to be mercaptans, but so far they have not been isolated and identified.

Reference is made to discussion of the problem in the 102nd Alkali Report (1965) and to its conclusions. These say that there is no evidence of any public health hazard from sulphur oxides or fluorine compounds, but that there is a farming hazard. And as no practicable means of treating the waste gases has yet been found, "we are at present forced to conclude that the volume of waste gases is so large and the concentration of contaminants so low that resource must still be had to tall chimneys (generally 225 ft.) to effect adequate dispersion."

Reference is also made to the special study of air pollution made in 1960 by the County Medical Officer, which had concluded that the sulphur dioxide concentration in the area was comparable with that in a small industrial town, but that for smoke and grit there was little difference from any rural area.

On the hazard to animal life attention is drawn to the 1964 report from the Ministry of Agriculture and

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* Obtainable from the County Planning Dept., 3 High Street, Bedford, price £1.

*A Brickworks in Bedfordshire*

Fisheries on "Fluorosis in Cattle" (reviewed in *Smokeless Air*, No. 133, Spring, 1965). The investigations on which this was based included a survey of farms in Bedfordshire, where it was found that 19 out of 43 farms were found to be affected by damaging fluorosis. The disease, which can cause bone damage, lameness, dental decay, and loss of condition, is promoted by an excessive intake of fluorine compounds deposited as dust on herbage.

In view of the wish to improve the landscape by the planting of trees, concern is expressed about the possible effects of pollution on the growth of trees and other vegetation, and about the types of trees best suited for the environment.

Summing up, the report says: "Much has been said about the effects of pollution, and many claims and counter-claims have been made, but sound factual evidence is still limited in supply and there is no intention in this report of judging the issues either way. It is clear that the situation regarding the health hazard needs to be kept under review in the interests of people living in the area, and more needs to be known about the effect on tree growth if effective landscaping is to be carried out. More information is needed as to the distribution of pollution generally and the time/space incidence of massive concentrations."

The Brick Companies, the Alkali Inspectorate, and the Warren Spring Laboratory are working together on the problem.

The conference, which was very well attended, was opened by Mr. Niall MacDermot, M.P., Minister of State, Ministry of Housing and Local Government, with Mr. Simon Whitbread, chairman of the Bedfordshire County Council, presiding. The discussion centred largely on the rehabilitation of the brickfield and the reclamation of the derelict land, often water-filled. Proposals made included the filling of the workings with colliery waste from Nottinghamshire, which has an acute disposal problem, and for filling up with ash from power stations and household refuse. The creation of recreational lakes is a further means, but this too has its problems. The cost of such schemes is a crucial factor: not only are the existing holes large and deep but over 100,000 further tons of clay are being excavated each week.

The Bedfordshire County Council deserves support for its imaginative and forward-looking desire to restore and make beautiful again what could be one of the pleasantest parts of Britain's countryside. What might be done is of course bound up with the need for an efficient and productive brick industry, which exists to meet urgent national needs.

# FUEL POLICY

## Conclusions of the White Paper

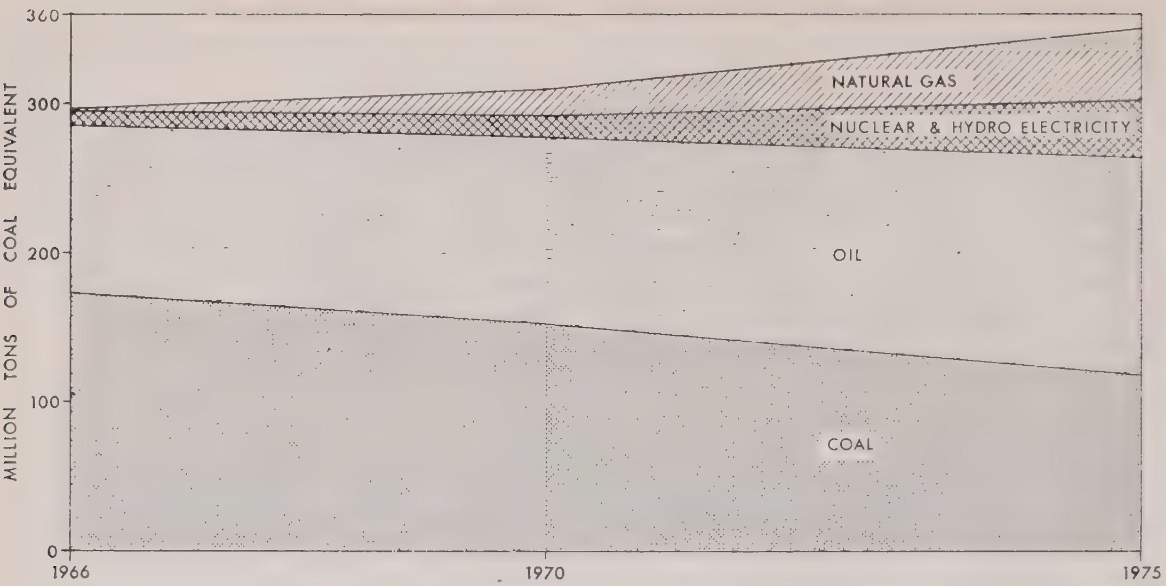
An editorial note on the Fuel Policy report (Cmnd. 3438, H.M.S.O., 8s. net) appears on another page. The most useful way of reporting the White Paper, for the record, and for reference, seems to be to reproduce its conclusions, which are as follows.

The post-war years have been characterized by rapid change in the energy sector. In coal, with the introduction of new, pioneering techniques of mining and the re-organization of the industry, productivity has risen by 50 per cent over the last ten years. Oil has grown to become a major source of energy and the base of new and vitally important industries. Nuclear power made its commercial debut in Britain and is on its way to becoming the principal fuel for new generating capacity. And now natural gas has been discovered in the North Sea on a scale which guarantees a fourth source of primary energy.

For British Industry this dynamic and vigorous pattern of development and change in the energy sector is of great significance because of the all-pervading impact of fuel costs on the economy. The continuing technical advances and improvement in efficiency in coal and oil and the emergence of nuclear power and natural gas are therefore developments wholly to be welcomed for their promise of ample, efficient and competitively priced energy supplies.

In great industries providing the livelihood of hundreds of thousands of people, rapid change and progress cannot be brought about without some painful readjustment, sometimes affecting whole communities. The coal industry has a fine record of successful adaptation to new methods and organization as a result of the close and enlightened partnership of management and men and their joint recognition of the challenge facing them. The development of nuclear power and the discovery of natural gas will allow the coal industry no respite in its continuing drive for greater efficiency. It must expect to lose markets to the newer fuels because of their inherent advantages in ease of handling, cleanliness and price, and even if it were possible for the Government to arrest this change in the pattern of fuel supplies, it would be to the disadvantage of the economy if they were to attempt to do so. But the economy would also suffer by too abrupt a decline in coal, which would put at risk the success of the industry's re-organization and result in needless hardship and waste.

The Government have therefore sought to provide in their policy the conditions in which all the fuel industries will find incentive for the most vigorous further development and progress aimed at supplying industry with energy at the lowest possible cost in resources, while



*Primary Fuel Consumption in the U.K. A diagram from the Fuel Policy White Paper*

tempering the impact of this policy on the coal industry by transitional measures to assist it in its re-organization. In framing these measures the Government have been at pains to avoid, to the maximum extent possible, distortion of the desirable long-term pattern of development in the energy sector.

The concentration in the White Paper on primary energy reflects its dominating importance for fuel policy as a result of recent developments. The magnitude of the developments highlights the need to think of fuel policy as an evolving subject, requiring constant review and susceptible to continuous adjustment. This need arises not only from change within the energy sector itself but also from the impact of broader economic and social circumstances, themselves liable to change. In their continuing review of fuel policy the Government's aim will be to make possible the supply of energy at the lowest total cost to the community having regard to the whole range of relevant considerations—economic and social—and to national and regional economic policies.

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## Chimney Heights

A second edition of the H.M.S.O. Memorandum has been published (2s. 6d. net).

The most important change made by the new publication lies in the treatment of fuel-burning plant emitting only small amounts of sulphur dioxide. In the 1963 Memorandum, the minimum uncorrected chimney height indicated by Appendix I is 40 feet, and even for quite small rates of emission the indicated heights are considerably above that level. Experience has shown that these heights are unduly onerous in relation to the smallness of the emission. Appendix I of "Chimney Heights" accordingly specifies uncorrected chimney heights starting at 16 feet and makes no provision for emissions of less than 3 lb. per hour of sulphur dioxide; a new Appendix VI gives final chimney heights for small fuel burning plant starting at 25 feet. As before, a separate set of "Permatrace" prints of the appendices are available from Her Majesty's Stationery Office.

Improvements have also been made to a number of other paragraphs in the Memorandum; it will be noted in particular that the scope of "Chimney Heights" has been expressed in terms of the rate of sulphur dioxide emission instead of the maximum continuous rating of boiler plant or the fuel consumption of furnaces.

# House Martins and Lichens in London

*By an interesting coincidence we are able to report two papers concerned with air pollution and London's natural history. The one shows how the reduction in smoke is encouraging the return of the House Martin to the capital; the other how the continuing pollution by sulphur dioxide is inhibiting to existence of Lichens.*

## The House Martin in London

"In the summer of 1966 a small colony of House Martins (*Delichon urbica*) was discovered in Harley Road, near Primrose Hill. This is the first recorded nesting of the species in Inner London since the disappearance of a colony at Westbourne Grove, Bayswater was reported in 1899 (Fitter, 1949). It seems worthwhile, especially in view of the suggestion that the reduced air pollution in Inner London might be more favourable to insectivorous species (Cramp and Tomlins, 1966), to examine whether this nesting at Primrose Hill was a reflection of a general increase in the inner districts of London in recent years."

This is the opening paragraph of a recently published "London Bird Report" of the London Natural History Society, by Stanley Cramp and John Gooders.

The investigation that has been made shows that there had been a slow retreat of the House Martin from the inner districts of London up to about 1950. Since then there has been a definite increase and spread in the south-west, especially at Hammersmith, and a return followed by an increase and spread in the north-west around Hampstead. The two figures from the report that we reproduce clearly indicate the remarkable change that has occurred.

The author explains that the House Martin requires flying insects for food and mud for nest making. They say that it seems no accident that the main nesting areas of the species in the inner zone of London are in the south-west, with its tidal Thames and reservoirs, and the north-west, with the shallow lakes of Hampstead and Highgate. The Stoke Newington colonies in the north are also near reservoirs and park lakes. The south and south-east have many fewer suitable waters, and the east has been inadequately covered.

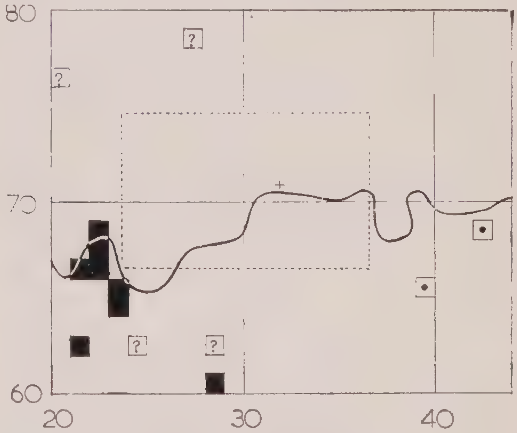

*Fig. I Breeding distribution of House Martins (Delichon urbica) in Central London 1945-1949. Black squares indicate breeding, squares with dots probable breeding, and question marks possible breeding. Inner London area shown by dotted lines.*

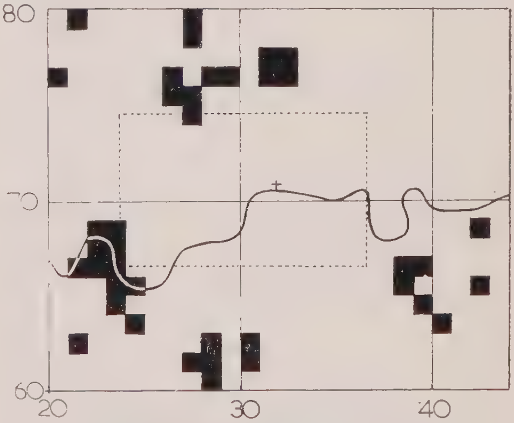

*Fig. II. Breeding distribution of House Martins (Delichon urbica) in Central London 1960-1966. Black squares indicate breeding.*

The increase and spread in recent years in the numbers of nesting House Martins cannot, however, be due to any marked changes in the area of water supplies or supplies of mud for nesting. "Indeed the only known new local factor is the lessened air pollution which may have led to an increase in the number of flying insects."

Making reference to the paper by Craxford, Clifton and Weatherley at the International Clean Air Congress, London, 1966, it is pointed out that "this improvement is confined to smoke pollution which in London is estimated to have dropped by about two-thirds between 1952 and 1965, while the concentration of sulphur dioxide, mainly from electric power stations, has changed little in this period".

Examination of the areas in which the House Martin has established itself, with the pollution levels in those areas, shows that "there appears to be a reasonable association between the breeding distribution of the House Martin and the degree of smoke concentration, especially when regard is paid also to the two other important factors, the presence of water and mud".

"The most likely assumption is therefore that the increase and spread of breeding House Martins in the areas adjoining central London in recent years is linked with the decrease in smoke concentration and a consequent increase in flying insects. This cannot be proved, however, as there appear to be no available figures to show whether the numbers of flying insects have increased or not.

It may be fortuitous, but it is of interest to note that the report makes special reference to Hammersmith, which has of course been in the lead in smoke control in London, and has in fact now completed its programme, as reported on another page.

## Lichens in London

A number of studies have been made on the well-established deleterious effects of air pollution upon lichens. An important contribution to this interesting subject is a paper *A Study of the Lichen Flora of London*, by J. R. Laundon of the British Museum (Natural History) in the *Lichentologist* (3, 1967, part 3, p. 277-327).

The lichen flora of London, covering an area within a radius of 16 kilometres from Charing Cross, is described and analyzed. It is found that air pollution is the chief factor affecting lichens. These plants possess a highly efficient mechanism for accumulating a wide range of substances, and if contaminants are absorbed they soon build up to lethal concentrations, or—another view—the damage may be done by impairment of the metabolic processes. Polluted air effectively prevents the establishment of many species. There is good, if not conclusive, evidence that sulphur dioxide is the pollutant which deleteriously affect lichens. Correlations between the numbers of species present and the sulphur dioxide concentration have been found, as has a lack of correlation between flora and smoke levels.

Low humidity in towns is also an important factor, but air pollution is considered to be more important.

Until the 19th century air pollution affected lichen flora only in the small built-up area of London, but after the late 19th century the flora continued to decline as London expanded. In the early 19th century it is probable that the total number of lichen species in the area exceeded 200, but only 62 have been observed since 1950. Central London, it is said, has only a single species, and has "the poorest lichen flora of any known city centre".

Lichens are frequently introduced into the London area, either deliberately or accidentally, but they quickly die out in the polluted air.

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**B.C.U.R.A. Director**

The Council of the British Coal Utilization Research Association has appointed L. C. F. Blackman, Ph.D., D.I.C., F.R.I.C.A., A.I.Ceram. M.Inst.F., as Director General of the Association.

Review

# New Edition of Stern's Air Pollution

**Air Pollution. Edited by Arthur C. Stern. Vol. I: Air Pollution and its Effects. pp. 850. Academic Press, New York and London. £13.1s. net.**

The first edition of this work, so ably edited by Arthur Stern, was published in 1962 in two volumes, comprising over 1200 pages. It has been the most comprehensive text and reference book on air pollution yet produced. A new, completely revised and re-organized edition is now on its way, and the first of three volumes, dealing with air pollution and its effects, has been published. Volume II will deal with analysis, monitoring and surveying, and Volume III with the sources of air pollution and their control. They will have about 600 and 800 pages respectively, and both are expected later this year. It will be noted that the new edition will be considerably larger than the old.

Volume I contains 19 contributions, all, it need hardly be said, by recognized experts in their fields. Part I is concerned with air pollution itself—classification and extent, gaseous pollutants, non-viable particles, viable particles, radioactive pollution, atmospheric reactions and scavenging processes. Then follows Part II, on air pollution meteorology in its various aspects, and Part III on the effects of air pollution. It is impossible to discuss the contents or attempt a critical review of such an encyclopaedic work in a short notice. The array of knowledge and expertise over such a wide field of subjects, so skilfully gathered together by its editor, is indeed daunting, and one can only congratulate him and his authors upon the success of their ambitious and invaluable project.

The printing and layout are of high standard, and there are excellent references to each contribution as well as general indices of authors and subjects. The one drawback for the ordinary reader is of course the price, especially for the set of three volumes, and this must limit sales to research and industrial organizations and the like. Nevertheless, the work represents good value for money.

# AIR POLLUTION CONTROL DIPLOMA

A new examination for a "Diploma in Air Pollution Control" is to be introduced by the Royal Society of Health.

It is to replace its existing examination for its present "Smoke Inspectors Diploma" and will apply to all approved courses beginning on or after 1 September, 1968, and to all examinations held on or after 1 January of next year.

"The new title of the examination", said a Society spokesman, "will convey a more accurate impression of the scope of the examination and the nature of the duties which an officer with such a qualification would be engaged upon during his employment."

Not only have the examination regulations been modernized, but the syllabus has been completely revised and extended.

The examination will comprise two papers, each containing six questions, five of which must be answered. There will also be an oral test.

Existing courses held at some 38 colleges in London and the provinces will consequently have to be revised. These establishments will now have to apply to the Society for recognition of a course to meet the requirements of the extended range of subjects.

# DOMESTIC COAL CONSUMPTION

## Regional Analysis

Domestic smoke emission, now estimated as 900,000 tons per annum (see table in the last issue), is roughly proportional to the amount of bituminous coal burned in the home. From the Ministry of Power's *Statistical Digest* for 1966 the following figures are obtained, showing the weight of coal, in hundredweights consumed per head of population, in each region during that year. Also given is the weight per head of the solid smokeless fuels used, comprising coke, boiler fuel, and premium solid smokeless fuels.

| *Region* | *Cwt. per head*<br>*Coal* | <br>*Solid Smokeless fuel* |
|---|---|---|
| South East: London | 1·8 | 4·3 |
| South East: Remainder .. | 4·2 | 4·2 |
| South West .. | 5·5 | 4·0 |
| East Anglia .. | 7·5 | 3·5 |
| Wales .. .. | 10·1 | 4·0 |
| Scotland .. .. | 10·2 | 1·0 |
| Midlands .. .. | 10·4 | 2·4 |
| North Midlands .. | 12·7 | 2·8 |
| North West.. .. | 13·4 | 3·0 |
| Yorkshire & Humberside .. | 13·6 | 2·2 |
| Northern .. .. | 15·7 | 1·9 |

Among the points of interest revealed by these figures are that London is so far the only region where smokeless fuel predominates over raw coal, although the remainder of the south-east has now drawn level; that there is a very marked gap between the south on the one hand and the midlands and north on the other; that solid smokeless fuel has still a long way to go in Scotland; and that the amount of raw coal used in the Yorkshire and Northern areas—where of course concessionary coal is widely used— clearly reveals where smoke control is most necessary. The coal figure for Wales will not be strictly comparable with the others, as it will include smokeless and other low-volatile indigenous coals.

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### Asbestos

Readers who have read the paper by Bonnell and Lawther at the Blackpool conference last October will recall their discussion on the hazards arising from asbestos in the outside atmosphere. This warning is reinforced by a recent publication of the Factory Inspectorate, *Problems arising from the use of Asbestos* (H.M.S.O., 3s. 9d. net). This survey is of course concerned with the hazards to workers in asbestos preparation works and in industries using asbestos, but reference is made to the discharge of dust-laden air from factories as a possible danger to the general population, "and we recommend that even where there is no recirculation of air in the factory, a similar high standard of filtration should be required from discharged air".

It is also pointed out that air-borne dust from asbestos waste dumps is an additional possible source of hazard which requires control.

The report points out that the industry is growing, there being nearly 20,000 persons employed by firms with ten or more employees, compared with 6,000 in 1935, and that there are some 300 registered factories to which present regulations are applied. There are in addition an unknown number of persons engaged in work involving asbestos, such as lagging and insulation.

It may be suggested that any local authority in whose area there is an asbestos works should make sure that no hazard to the general population is present.

# *INTERNATIONAL SECTION*

*Italy*

## NEW POLLUTION CONTROL LAW

A comprehensive air pollution control law has recently been approved by the Italian Parliament. It presumably will not come into force until the organization required, and the regulations referred to, have been effected. The law covers the whole country and begins by defining two types of area, A and B zones, according to population, seriousness of pollution problems and other factors. Some of the regulations vary in their application according to this zoning.

Zone A municipalities are those in northern and central Italy with populations between 70,000 and 300,000, those with smaller populations where pollution problems may arise, and municipalities in southern and insular Italy with populations between 300,000 and 1m., or again smaller ones liable to air pollution. Zone B covers municipalities in the central and northern parts with populations over 300,000, and in the south and islands populations over 1m.

A central commission on air pollution is to be set up, and there are also to be regional committees. All fuel-burning plant of more than 30,000 kcal/h (about 120,000 Btu/h) are subject to control under the Act, and any new or extended plant above this limit is subject to prior approval. Plans must be submitted for approval to the commander of the provincial fire-fighting services, who is also required to carry out tests.

Fuel usage is controlled. Exempt from the limitations laid down are gas, petroleum fuels of less than 1 per cent sulphur content, coke, wood, and lignite. The control over other fuels take into account a number of factors, including the viscosity and sulphur content of liquid fuel, the volatile matter and sulphur content of solid fuel, and the character of the district, and whether Zone A or B.

Another chapter of the Act requires the efficient operation of plant, and provides for regulations to be made defining pollution limits. On a second offence licence to operate may be withdrawn. Operation of plant above a stated capacity requires a certificate of competency. There is provision for training courses for operatives, and for examinations. The fire-fighting services organization may make inspections of plant and take samples of fuel for analysis. Industrial establishments must be equipped with plant and means necessary for conformity with the regulations, and this is backed by powers to enforce the closure of offending establishments.

A further chapter deals with pollution from motor vehicles, and provides for emissions to be limited in accordance with standards to be made in regulations.

The penalties for offences under the various sections are stated in the Act, and in some cases go to a maximum of 1m. lire.

*Netherlands*

## RESEARCH REPORT

The Research Institute for Public Health Engineering T.N.O. (Schoemakerstraat 97, Delft, the Netherlands) have published their report for 1966, with (very helpfully) an English language edition. The subjects covered by this active Dutch organization cover water and soil, air pollution, indoor air pollution, indoor climate, sound, lighting and insulation, and housing.

The section on air pollution is largely concerned with reporting on investigations carried out and being developed in a number of areas. Descriptions are given of new and improved instruments and techniques developed for these purposes.

*U.S.A.*

## NEW AIR QUALITY ACT

The U.S.A. Clean Air Act of 1963 was the first federal measure for the control of air pollution: it reaffirmed the policy of State and local responsibility for control activities, but authorized the Department of Health, Education, and Welfare to undertake many new supporting activities. Under amendments enacted in 1965 national standards for the control of motor vehicle pollution were established. (See below for reference to new standards recently made.)

There has now been passed a further law, the Air Quality Act of 1967. Under this law control remains with the State and local authorities, and it is described as "a blue print for a systematic effort to deal with air pollution problems on a regional basis." It calls for "co-ordinated action at all levels of government and among all segments of industry".

The system which this new legislation develops hinges on the designation of regions where two or more communities—either in the same or different States—share a common air pollution problem and on the development and implementation of air quality standards for such regions.

The H.E.W. department will define the broad atmospheric areas of the nation and will designate specific air quality control regions.

The department will develop and publish air pollution criteria indicating the extent to which air pollution is harmful to health and damaging to property and detailed information of the cost and effectiveness of techniques for preventing and controlling pollution.

Then—and we are quoting from an explanatory brochure—as soon as air quality criteria and data on control technology are made available for a pollutant or class of pollutants, States will be expected to begin developing air quality standards and plans for their implementation. They will have 90 days to submit a letter indicating that they intend to set standards, 180 days to set the standards, and 180 days to develop plans for implementing them. Air quality standards will be developed and applied on a regional basis.

If a State fails to establish standards, or if they are not consistent with the Act, action may be taken to ensure that appropriate standards are set.

Among many other provisions in the Act there is expansion of federal research and development activities, the continuation of grants, and the setting up of a 15-member Presidential Air Quality Advisory Board—similar, maybe, to the British Clean Air Council. There is also a requirement for the registration of fuel additives, and one for the study of the feasibility of controlling pollution from aircraft.

### New Vehicle Exhaust Standards

The present standards for pollution from road vehicles in the United States are to be more stringent for 1970 model cars.

The new standards, which would replace standards effective with the 1968 model year, would lower by about one-third the 1968 level of allowable automotive exhaust pollutants by requiring 77 per cent control of hydrocarbon emissions and 68 per cent control of carbon monoxide.

In addition, the 1970 standards, published today in the Federal Register, would for the first time:

—Require cars and light trucks to control 90 per cent of the evaporation of hydrocarbons from gas tanks and carburettors;

—Require 35 per cent control of hydrocarbons and 37 per cent control of carbon monoxide in exhaust of gasoline-powered heavy trucks and buses;

—Limit smoke from diesel-powered vehicles to a faint plume.

There is no change from the 1968 standard which requires 100 per cent elimination of engine crankcase emissions from automobiles and light trucks.

As proposed, the 1970 standards would limit exhaust emissions from automobiles and light trucks to 2·2 grams of hydrocarbons and 23 grams of carbon monoxide per vehicle mile. The effect of the 1968-model standards is to limit exhaust hydrocarbons from a typical vehicle to 3·2 grams per mile, and carbon monoxide to 33 grams. A typical uncontrolled vehicle gives off 9·7 grams of hydrocarbons and 71 grams of carbon monoxide per vehicle mile.

The proposed 1970 standards also incorporate refinements which ensure a more equitable regulation of exhaust emissions. The 1968 standards are expressed as maximum pollutant concentrations in exhaust gas. In general, the exhaust from small motor vehicles has a higher concentration of pollutants than the exhaust from large vehicles. However, the large vehicle discharges a greater volume of exhaust than the small vehicle, and in travelling a given distance may discharge an equal amount of pollution to the atmosphere. As a first step towards uniform regulation of the *amount* of pollution discharged by vehicles whatever their size, the 1968 standards specify different exhaust concentration limitations for three engine displacement ranges, imposing the least stringent limitations on the smallest engine range. The concentration limitations are derived from the relationship between engine displacement and the total volume of exhaust discharged per mile. This relationship can be defined only roughly, and *within a displacement range* the single concentration limitation results in more stringent control of the smaller engines in the range.

### Tall Stacks Investigation

A major new study of the usefulness of tall smoke stacks in dispersing pollution in the atmosphere has been launched by the National Centre for Air Pollution Control (N.C.A.P.C.) of the Public Health Service, U.S. Department of Health, Education, and Welfare.

Co-operating in the study are the Pennsylvania Electric Company and the Division of Air Pollution Control of the Pennsylvania State Department of Health. Mr. Robert A. McCormick, Chief of the N.C.A.P.C.'s Meteorology Program, is directing the project.

The principal purpose of the study is to determine, through actual measurements in the vicinity of three coal-burning electric power generating stations, the extent to which tall stacks serve to disperse pollutant gases released into the air and the extent to which they contribute to ground-level concentrations of pollution. These measurements will supplement data already derived from smaller-scale studies and from mathematical models.

Attention will be focused primarily on sulphur oxides, one of the most common and most harmful types of air pollutants.

### Gas Tracer

Scientists of the Public Health Service's National Centre for Air Pollution Control have developed a gaseous tracer system that is so sensitive that the gas used can be detected miles from the source in concentrations of 1 part per 100 trillion parts of air.

The gas, sulphur hexafluoride, which is non-toxic, can be released in a known concentration and measured downwind to determine how much it has been diluted by the atmosphere. Successful experiments have been conducted over a range of up to 70 miles from the source.

By using the gaseous tracer system,

scientists of the National Centre expect to expand present knowledge of the dispersion and dilution forces of the atmosphere on gaseous pollution transported from one city to another.

One use to which the new technique can be put is to measure the dispersal effectiveness of tall smoke stacks by releasing the tracer gas from the stack. Air pollution control authorities may also be able to use the method to show transport of pollution across jurisdictional lines, either interstate or intrastate. By releasing a known trace material such as sulphur hexafluoride that is usually absent in the atmosphere and then sampling and capturing it at another point downwind, they can obtain information on the transportation of harmful pollutants in the air.

*France*

# THE RANCE TIDAL POWER STATION

It is in comparatively few places in the world that the range of the tide is sufficiently great to make worthwhile the harnessing of tidal energy by the installation of expensive power plant. One such place on the eastern seaboard of America is the Bay of Fundy where the effective tidal range is in the order of 47 feet. Here, gigantic works were started in the 1930's but, for various reasons, were abandoned. Our own scheme for making use of the tides in the Bristol Channel, where the range is of the order of 42 feet, has also been suspended.

But the Rance Tidal Power Station, after 7 years of work and development, is now in operation in N.W. France some 3½ miles south of St. Malo. The French have succeeded in utilizing the 28m. horse power of the incoming tide from the Atlantic Ocean in the English Channel to produce 540m. kWh each year.

The Rance Estuary was chosen for this project because the average range of the tide there is of the order of 36 feet and the geological structure of the banks and bed of the river made possible the construction of the dam to contain the inland lake which covers an area of over 8½ square miles.

Only one system, known since antiquity, makes it possible to harness the energy of the tides—that of a tidal mill wheel. The estuary is closed by the building of a dam in which of course is incorporated a sluice gate. The sluice is opened on the flood tide and the basin is filled. On the ebb, the basin will empty itself and the outflow is used to turn a turbine of the Kaplan type. This operation can be reversed by using the incoming tide to turn the turbine; but this method is not as effective as the emptying process.

In the Rance project both methods are used and the double way operation produces 18 per cent more energy than the single operation of emptying.

Obviously the output from a tidal power station will not only vary in amount in the course of the month because of the tidal coefficient, but it will also vary in time each day because of the state of the tide; and in the past much research has been done to attempt to remedy this fundamental irregularity. To a certain extent, this irregularity, since the general linking up of France's electricity supply, is now of less importance; but the fact remains that the commercial value of a kilowatt/hour varies according to the time of day, and financially speaking it is not at all the same thing to produce plentiful energy at 3.00 a.m. or 6.00 p.m.

The French have overcome this problem by developing reversible sets of turbo-alternators. Such sets not only operate as generators but also, by borrowing energy from the national network, operate as pumps. By this means no less than five types of operation are possible:—

(i) The water enters the basin, turning the turbine and producing energy.

(ii) At high water, energy is taken

The Rance Estuary Power Dam

from the national network to operate the turbine as a pump to "overfill" the basin.

(iii) The water then flows out to sea, turning the turbine and producing energy.

(iv) At low water, energy is again borrowed to completely empty the basin.

(v) As necessary the turbine blades can be feathered to allow the water a free passage.

The French claim that the number of cycles that can be used in the course of one moon is quite staggering and the installation of a computer is envisaged to assist the six men employed at a time as supervisors of the 24 sets of turbines.

The turbines, which the French call "bulb" sets, are of German origin and are not unlike a small submarine sunk in a fixed position in the current. Each has a large propeller—the diameter is is about 18 feet—which turns quite slowly at 94 r.p.m. These machines will each produce 10,000 kW, and it is estimated that the annual output will be of the order of 540 million kWh.

The "bulb" sets are positioned in hydraulic tunnels about 175 feet long, along the axis of the Rance. The sides of these tunnels form the piers which support the actual dam power station which is itself in the form of a concrete tunnel some 400 yards long. To the west of the power station is a lock to allow ships to proceed up the estuary; to the east is a fixed dyke linking the station to the Chalibert islet, and between the islet and the eastern shore is a movable dam with roller gates.

The sluice gates in the dam produced their own special problems. In a river dam, the sluices are opened very rarely—when the river is in spate. And the thrust of the water on them is from one side only. In the Rance sea dam, the thrust of the water is first on one side and then on the other. They therefore have to be doubly watertight and they must open and shut every day to ensure the filling and emptying of the basin.

But this problem, along with many others, has been overcome. The project which used 23,000 tons of steel, 400,000 cubic yards of concrete and caused the moving of 520,000 cubic yards of earth, has been completed and is producing electricity carried to the French national network by overhead cables.

By some standards, the output of the Rance power station is not high; it is, for example, scarcely more than half the output of one of the French power stations on the Rhine. But its output is assured for there are neither dry years nor flood years in the power taken from the sea. And this station does not use fuel; it is completely smokeless and fumeless.

All credit is due to the engineer responsible, M. Mauboussin for this work pioneered by France.

# STREET POLLUTION IN PARIS

The Municipal Laboratory of the Préfecture de Police has published its report *Etudes de Pollution Atmosphérique dans le Departement de la Seine, 1966*. The report is in four sections, each with numerous tables and diagrams, covering the subjects investigated. These are called Operation Carbon Monoxide, Operations "Garages", a study of anti-smoke additives and Operation "Boucle de la Seine".

The investigations are concerned only with pollution arising from road vehicles, and the first part is concerned with the continuing measurement of carbon monoxide. Measurements are made at 317 points in the city—one in each square of a grid into which the area is divided. Concentrations of over 40 p.p.m. are regarded as serious, and a number of points exceeding this are given special mention, and include the Rond-Point des Champs-Elysees.

Tests were also carried out in road tunnels and under-passes, and in two of them concentrations of 72 and 84 p.p.m. were found. In general, the pollution is very slightly greater than in 1965.

"Operation Garages" was the code name given to measurements in two types of garage used for parking—underground and on the fifth and sixth floors of a building. Observations were made at hourly or 20 minute intervals, and peaks of over 100 p.p.m. were found at underground garages.

As a result of this work the Conseil d'Hygiene Publique et de Salubrite of the Departement de la Seine has fixed norms for air quality as follows: the limits of carbon monoxide concentration in the atmosphere of underground parking garages must not exceed 50 p.p.m. on average over a period of eight consecutive hours, or of 100 p.p.m. at any instant.

The observations on the fifth and sixth floors of a building that are used for parking showed CO concentrations rising to a maximum of 148 p.p.m. at one time on the fifth floor, and to 132 on the sixth floor. Measurements were also made of the CO content of the blood of non-smoking mechanics working in the garage. These showed for example, taking the largest change observed, a concentration (in $cm^3$ per 100 $cm^3$ of blood) rising from 0·75 before work to 1·40 after work. It is pointed out that even non-smokers had a moderate dosage in the blood even before starting work in the garage.

Tests have been made on barium-based motor fuel additives. It was found that they did reduce smoke emission from diesel engines, and that this was more marked if the quantity of additive was increased. There appeared to be no effect on the emission of carbon monoxide, aldehydes, nitrogen oxides, or oxidants. The emission of barium compounds in the exhaust was measured and it was considered that its concentration in streets was practically nil, and in garages very small.

Operation "Boucle de la Seine" reports a special investigation made in a district in the north-west of Paris, between Nanterre and Villeneuve-la-

Garenne, because of the disquiet of the population about industrial pollution. A number of deposit gauges were set up and their contents analyzed. It was found that the area around a suspected source was abnormally polluted by dust and deposits in which there was a large amount of benzo-3:4-pyrene. The highest concentrations were found close to the suspected source, which was a works treating coal and tar.

### Second Control Zone in Paris

As published already in Smokeless Air (Winter 1964) French regulations of 11 August, 1964 had made provisions for the establishment of two special "control zones" in Paris, where various air pollution prevention measures were going to be imposed.

We have received a colourful publicity leaflet from the Préfecture de la Seine which shows that the second Paris smoke control zone came into operation on 1 October, 1967. By this date also, all the remaining provisions regarding the burning of fuel etc., in the first zone had gradually come into force.

*German Federal Republic*

## H. STEPHANY HONOURED

An appreciation of Ministerial Dirigent D. Dipl.-Ing. H. Stephany's work and services to the Verein Deutscher Ingenieure (Association of German Engineers) was published in the V.D.I. News on the occasion of his 70th birthday on 30 October, 1967. Chairman of both V.D.I. technical sections, the Clean Air Commission and the Dust technology group, Min.-Dir. Stephany was born in 1897 in the Eifel province of Germany. After a technical education, he was already active by 1925 in the service of industrial inspection remaining in this field until the end of the war and returning in 1950 after a period of work in industry. In 1951, he was given an appointment in the Federal Ministry of Labour. His work there was particularly concerned with the protection of human beings from potential danger of a technical environment. Under his direction important regulations were prepared, including some relating to air pollution.

In 1962, Min.-Dir. Stephany took over the chairmanship of the two technical sections of the V.D.I. and under him the work on the V.D.I. Directives (Richtlinien), which has been started in 1955/6, was continued with renewed vigour. The Directives gained general recognition and served not only as basis for German Clean Air legislation but also attracted considerable attention abroad. During the Munich meeting of the V.D.I. Clean Air Commission last October, Min.-Dir. Stephany was awarded the V.D.I. medal of honour in gold, with an inscription to commemorate his special services to the work of this organization.

*Japan*

## AIR POLLUTION THREAT

This is the title of a leading article (16 October, 1967) in the English language *Japan Times* of Tokyo, which we are taking the liberty of reproducing in full. Not only does it express the views of a responsible and thoughtful newspaper and provide information about the growth of air pollution in Japan, but it is an illuminating appraisal of a situation that, after apparently having been neglected for too long, is now being given anxious attention.

A survey of smog in the rapidly expanding industrial areas of our nation contains some disquieting findings. The Construction Ministry took daily spot data on smog in three industrial areas—the Chiba City-Ichihara zone in Chiba, the Tokuyama-Nanyo district in Yamaguchi, and Yokkaichi in Mie—over a period of two and a half years.

In its report on Chiba, the ministry warned that if measures against smog are not strengthened, an area around Tokyo Bay 20 kilometers in length and five kilometers in width will no longer be fit for human habitation by 1985.

The Ministry refused to release the results of its survey of the Yokkaichi area, notorious for its smog since it became the centre of a petrochemical complex. Ministry spokesmen were quoted as saying they did not want to arouse fears among the already jittery population of the area.

The survey was based on the Japan Public Health Association's ruling that sulphuric acid gas density in the atmosphere should not exceed 0·1 p.p.m. in a residential area.

The Construction Ministry pointed out that density of the toxic gas in the atmosphere over the Chiba-Ichihara district ranged up to 0·1 and 0·2 p.p.m. It pointed out that when new reclamation projects now in progress are completed and factories concentrated on them start full operations in 1985, the industrial belt would cover 8,000 hectares, or three times its 1965 area. And it predicted that unless anti-pollution measures were intensified, sulphuric acid gas density would go up to 0·3 p.p.m., making the area unfit for human life.

The obvious answer to the problem is to strengthen measures against air pollution. Among the Construction Ministry's suggestions are raising the heights of chimneys of thermal power stations, one of the worst sources of sulphuric acid gas, wider use of low sulphur-content fuel, installation or pollution trap equipment, and reforms in the methods of expelling gases.

These are the immediate measures which suggest themselves. But over the long run, a broader review of our city planning policies is needed. We need more stringent zoning to keep factories out of residential areas, better planning to create park areas and more open spaces, and the stiffest type of penalties—backed up by law enforcement officers and the courts—against offenders who make flouting the law a habit.

The Construction Ministry announces it will extend the survey next year to other industrial areas including the Joban-Koriyama district. That is fine. But unless the Government is willing to follow up by punishing those who are making these areas uninhabitable, surveys are just a waste of time, and money.

Whether or not it marks a trend, there has been an increase in the exodus of high-income families into the suburbs. As office buildings, and apartments increase in the central part of the capital, many well-to-do homeowners are moving out of high quality residential communities from which they commute to their downtown offices. In other sections of the capital, factories are dispersing out of the central areas, and are being replaced by high-rise apartments for the masses. One of the newest of these is the Hinode Danchi in Adachi Ward.

In more ways than one, this is a welcome development. The apartment structures proper occupy only 40 per cent of the land site at Hinode, leaving 60 per cent open for a playground, pond and garden area. It has added a fresh look to a section of the city which was sadly in need of such.

That was the original idea of the Metropolitan authorities in their suburban land development programme—to move high-income families who could afford it into the country and suburban areas, and settle the low-income families in the central city areas where transportation, recreation, and shopping is cheap and convenient.

It is a pity that this could not have been started earlier, before the giant danchi blocks had time to mushroom in distant and inconvenient portions of Kanagawa, Saitama and Chiba, hours by bus and train from the jobs in Tokyo to which many of their inhabitants commute daily.

## OVERSEAS NEWS IN BRIEF

### Increased European Pollution

At a seminar at Upsala, Sweden, Dr. S. Oden reported that information collected since 1952 by a network of meteorological stations on the mainland of Europe had shown that since 1960 there has been an abrupt rise in the acidity of rainfall. This has been attributed to an increasing content of sulphur dioxide in the air.

### World Temperature Fall

Dirty air apparently is causing the temperature of the earth's air envelope to drop, according to Dr. James P. Lodge, of the National Centre for Atmospheric Research in Boulder, Colorado, U.S.A. The average temperature has dropped one-half a degree F since 1950, he finds, reversing a trend of slowly rising temperatures. The average is now what it was in 1850.

Dr. Lodge reports that air pollution in the form of fine particles, blocks some sunlight from reaching earth. Calculations made on the amount of cooling to be expected from pollutants came to just about the half-degree experienced in the last 17 years.

### Electrostatic for Cars

An electrostatic precipitator for cars to trap particulate matter is being studied by the National Centre for Air Pollution Control. Two prototypes—one for a diesel and one for a gasoline-fueled engine—have been submitted by Gourdine Systems (Livingston, N.J.). The precipitators are to be installed on the tail pipe; road tests will be made soon. Particles will be charged, then precipitated into a cartridge that can be removed, emptied and replaced every few thousand miles. It's hoped that the device can significantly reduce emission of lead, chlorine, bromine, iron, sulphur and carbon. Tests are expected to take three months.

### Hybrid Power Car

A research team at Pennsylvania University is reported to have designed a car powered by an internal combustion engine and a battery. The project is for a three-passenger vehicle, about 9 ft. long, powered by a two-cylinder engine and a battery, giving a top speed of 60 m.p.h. It is said that it would give only one-tenth the air pollution of a standard car.

### Costing Clean Air

Durban, Natal, City Council is reported to be seeking refunds from the South African Government for costs incurred in the promotion of clean air. Legislation obliges local authorities to take action but is silent on the financial implications.

### Finger in the Dyke

Dr. J. A. Teller, dean of engineering, Cooper Union College, New York, told a Los Angeles audience that American people would have to abandon the "finger-in-the-dyke techniques" if they want to end air pollution and would have to use modern "idiot-proof techniques".

He laid the blame for 80 per cent of all noxious and toxic materials emitted into the atmosphere on the daily waste-making activities of ordinary Americans. "We eat and create garbage. We read and throw away newspapers. We burn this waste and create pollution.

"We heat in cold weather and cool in hot weather, and we burn fuel to achieve both, and in doing so create more pollution. We enjoy the luxury of private transportation and spew noxious gases and particles from neglected engines."

In Los Angeles alone, he said, the petrol wastage resulting from incomplete combustion and evaporation was estimated at 700,000 gallons a day.

### Diesel Ban in Malaysia

The exhaust Fume Study Committee has recommended that the Government ban diesel-powered motor vehicles from the roads of Bangkok to reduce the smog in the city.—Reuter.

## CORRECTION

We regret errors in the second paragraph of the report on new Czechoslovakia air pollution legislation in the Winter 1967 issue, page 101. These were due to misinterpretation of the original document in Czech, a translation of which has now been obtained.

The reference to "k" should not have been to the tax charge in korunas, but to the "k max" figures that relate to pollutants other than grit and dust, and sulphur dioxide, expressed as maximum instantaneous concentrations as laid down in directives issued.

The tax involved consists of basic charges, surcharges that vary with the character of the district, and the excess of pollutants emitted over the permitted level for a particular height of chimney.

# NORTHERN IRELAND DIVISION

## *Four papers at Ballymena Meeting*

A very successful and worthwhile autumn meeting of the Division was held in the Town Hall, Ballymena on 15 November, 1967. The meeting was very well attended by representatives from government departments, local authorities and other public bodies, and industrial and professional organizations. The meeting was presided over by the Chairman of the Division, R. Campbell Brown, and a very cordial welcome was extended to all those present by the Mayor of Ballymena, Alderman James B. Millar.

Four papers were presented at the meeting. They were "Introducing a Smoke Control Area" by W. L. Fleming, F.R.S.H., M.A.P.H.I., Public Health Inspector of Castlereagh R.D.C., "Natural Draught, Flues and Chimneys" by H. H. McKinty, Chief Technical Officer of the Coal Advisory Services, Belfast, "Industrial Air Pollution" by A. Archer, F.R.S.H., F.A.P.H.I., Chief Public Health Inspector of Halesowen, and "Air Pollution Control in Great Britain, A General Survey" by A. R. Smith, B.Comm., F.B.I.M.

### Introducing Smoke Control

In the first paper, Mr. Fleming explained the whole process of setting up a smoke control area, and illustrated his talk by quoting from his own experience of being one of those directly involved in the creation of Northern Ireland's first smoke control area in Castlereagh.

After a brief reference to the Clean Air Act and its application, Mr. Fleming went on to discuss the necessity for smoke control areas. Although, since the passing of the Clean Air Act there had been an ever-widening interest in the subject throughout Northern Ireland, there was still a tendency for the man in the street to conclude that because of a lack of industrial processes in the area in which he lived, there was no air pollution problem in his district.

Although he would certainly observe the high industrial stack disgorging smoke, he would fail to notice the scores of domestic chimneys discharging their pollutants which had become almost a traditional pattern of urban life. It had, nevertheless, been clearly demonstrated that domestic smoke is far and away the chief pollutant of the air we breathe. The 32nd Report on Atmospheric Pollution issued by the Ministry of Technology made the point that the concentration of smoke in a town of say 5,000 inhabitants is not one-seventieth as might have been expected, but about one half of that in a city of 350,000 inhabitants. When these figures were applied to populations of the cities and towns of Northern Ireland, it gave some idea of the size of the problem.

However, there were signs that the work of the N.S.C.A. was having effect in bringing this knowledge to the notice of the public who were becoming aware of the deleterious effects on health of air pollution.

Mr. Fleming then explained how Castlereagh made their decision on the selection of the area in which to begin their smoke control programme which would embrace some twelve areas over a period of 15 years. They took into account such factors as wind direction, topographical features, the daily readings from a smoke and sulphur dioxide volumetric recorder, housing development and the money available.

Having obtained preliminary approval from the Ministry, a detailed survey of the area was undertaken and side by side with this a publicity drive was made. In this much help was given by the fuel industries. When the survey was completed and a smoke control order was published, there were only six objections but it was nonetheless necessary to hold a public inquiry. The result of this was soon known, the Minister announced Confirmation of the Order, and implementation went ahead.

This was a very busy time indeed—especially for the Public Health Inspector. The administrative duties also fell to his lot. These duties included:—

(1) Vetting of Estimates from Contractors for each work of adaptation.
(2) Assessment of the "Approved Cost".
(3) Calculation of grant payable by the Local Authority and the amount to be recovered subsequently from the Ministry.
(4) Informing the Applicant of the amount of grant he could expect to receive and giving permission for the work to proceed.

It was found in practice that, for a variety of reasons, the above routine had to be gone through several times in respect of each house, in more than 50 per cent of all cases. This of course was very time-consuming and any Public Health Inspector contemplating the recommendation of a smoke control programme to his Council should note and prepare accordingly!

In the twelve months following the Order becoming operative, the Council received a number of complaints from some residents who experienced difficulty in adapting to the new conditions. A careful analysis of these complaints showed that nearly all such complaints were associated with a forced draught open fire. When further examined it was found that there were three basic causes:—

(i) improper fitting of the fire.
(ii) a defective surround.
(iii) a defective flue.

Rarely was the fire itself at fault.

Investigation revealed that the four most common complaints were:—

(i) too rapid combustion of the fuel —which was usually caused by an ill fitting grate or the over use of a fan on a fan assisted grate.
(ii) poor heat transfer to the water—again usually due to the improper fitting of the fire.
(iii) fumes—in every case from a fire installed in a convector type metal surround in which the seals between the surround and the convector tubes and convector box were defective.
(iv) poor combustion, with which fumes were invariably associated —which was generally due to air starvation or flue defects.

Since the implementation of the Order, the Council received many expressions of appreciation from residents within the area, and other people living adjacent to the area expressed a desire to be included in the next smoke control area as soon as possible. The improvement of the cleanliness in the air was amply illustrated by the fact that the filters in an air filtration plant installed in a public institution downwind of the area were now only cleaned after five or six months instead of the earlier every few weeks.

One interesting point that Mr. Fleming made was of the adaptations on which grants were paid by the Council, 64 per cent were for solid fuel, 32 per cent for electricity and only 2 per cent for gas. This low figure for gas was probably due to some extent at least to their being no gas available in part of the area.

The average cost per house worked out at £34, a figure to be treated with caution as few old properties were involved. The highest individual cost was £110 for an old detached house, and the lowest was £6.

Mr. Fleming concluded that this was a worthwhile task. Its success depended on the dedication to clean air of those carrying it out, and above all to very good publicity.

### Domestic Chimneys

In his paper "Natural Draught, Flues and Chimneys" Mr. McKinty dealt first with the principles of natural draught and domestic chimney construction and second with the minimum requirements of the Building Regulations 1965. He gave a clear and factual dissertation on flue heights and stressed the importance of reducing heat losses. He continued, clearly and concisely, to discuss flue sizes, air leaks, constructional materials and frictional resistance.

Mr. McKinty continued by showing how downdraught was caused by downward wind currents and by differential air pressure and how important were the best position and fit of doors and windows. He suggested that although it was not always possible to have all "air leaks" on the high pressure side of a room or house, much could be achieved by the proper draught proofing of doors and windows leading into the suction zone.

Condensation and its effects were discussed at length. Mr. McKinty examined the most likely causes and showed that air dilution was a cheap and simple remedy in the majority of cases which were not too badly exposed.

On the subject of "terminals" it was explained that the terminal of a chimney was not only the pot or cowl often fitted as an afterthought, but also the cap and any constructional detail used to finish off the top. Various types of chimney pots and cowls were considered and it was pointed out that long tallboys, slip pots and similar terminals, especially if made of metal were generally undesirable.

On the other hand, flue linings were not only desirable but had a distinct advantage because they not only improved the insulating properties of the chimney but also produced a smooth uniform bore and resisted flue-acid attack. Chimney lining could not in all cases prevent condensation, particularly in exposed situations and it was therefore recommended that a suitable condensate trap should be fitted at the bottom of the lining in an external chimney.

The specification for linings under the Building Regulations of 1965 were given together with a statement of the minimum requirements for flue construction.

### Industrial Pollution

Mr. Archer introduced his paper on "Industrial Air Pollution" by outlining the setting up of the Beaver Committee following the London smog of 1952 and the salient features of the Beaver Report. He continued by giving details of the main pollutants but pointed out that he did not include pollution from motor vehicles in his discussion. His concern was with particulate matter which consisted of grit, dust and smoke, and with gases.

Mr. Archer went on to show how meteorological considerations affected pollutants leaving a chimney stack and touched briefly on thermal and mechanical turbulence and temperature inversion.

Control of pollution was briefly considered under two main headings—the emission of grit and dust and the emission of smoke and sulphur dioxide. The emission of sulphur dioxide led naturally to a consideration of chimney heights. The formula for determining the long term mean concentrations of pollutants at ground level was explained; and Dr. Craxford's statement that by the use of properly designed chimneys of sufficient height it had been possible to achieve a 15 fold increase in power station capacity without increasing the calculated ground level concentration of sulphur dioxide, was quoted.

Trends in pollution were then considered and the following information from the Report of the Warren Spring Laboratory quoted:—

(a) outside London there had been a decrease of 25 per cent of smoke in the air since 1958-59.

(b) outside London there had been a decrease of about 20 per cent in ground level concentration of sulphur dioxide although the emissions of sulphur dioxide had increased. This was thought to be due in part to the wise planning of industry and the use of high well-sited chimneys.

(c) smoke concentrations in London had fallen dramatically; present concentrations were only one-third of those in 1955-56.

(d) sulphur dioxide ground level concentration in London had decreased in the face of a marked rise in emission.

(e) grit and dust fall showed an underlying downward trend.

Mr. Archer concluded by considering the future and how town planning could alleviate the air pollution problem and stressed the points made by Dr. Craxford and Mrs. Weatherley on this subject at the 1964 Clean Air Conference. He added that an expert committee of the World Health Organization (W.H.O. Technical Report Series 297) considered that sound planning was essential to deal with the air pollution problem and recommended, amongst other things, the following:—

1. the siting of new towns should be undertaken only after a thorough study of local topography and meteorology;
2. new industries using materials or processes likely to produce air contaminants should be so located as to minimize the effects of air pollution;
3. satellite (dormitory) towns should restrict the use of pollution-producing fuels;
4. provision should be made for green belts and open spaces to facilitate the dilution and dispersion of unavoidable pollution;
5. greater use should be made of hydro-electric and economic power and of natural gas for industrial processes and domestic purposes, thereby reducing the pollution resulting from the use of conventional fossil fuels;
6. greater use should be made of central plants for the provision of both heat and hot water for entire districts;
7. traffic planning should be used to control pollution from motor transport in residential areas.

**A Pollution Survey**

As the title suggests, Mr. Smith's paper was a general and comprehensive survey of air pollution control throughout the country. Mr. Smith opened by stating that air pollution and its control had many factors—chemical, medical, technical, meteorological and economic—which had been applied at different times and in different degree. As a result of the Los Angeles smog and the air pollution disaster in Donora in the U.S.A. in 1948 and the London smog in 1952 there was now a greater interest being shown.

The setting up of the Beaver Committee and its report was next considered, and the progress of the last ten years as instanced in the recent report of the Warren Spring Laboratory was reviewed.

Mr. Smith then dealt with pollution from industrial sources under four headings—smoke from combustion, grit and dust from combustion, sulphur dioxide from combustion, and gases, fumes, smoke, dust and grit from Alkali Act processes. He considered that the problem of industrial smoke had been largely solved and that it was no longer a major contributor to air pollution. On the other hand, although some progress had been made, there was room for a lot more so far as grit and dust were concerned. Sulphur dioxide was still a problem and all we had really achieved was a palliative in the form of the tall chimney. Progress under the Alkali Act was a very large subject and only touched on. Some industries, however had achieved an excellent record, but problems still remained and some area problems were emerging.

In considering pollution from domestic sources, Mr. Smith was of the opinion that the domestic fire had now emerged as the major source of low level smoke and probably also, of sulphur dioxide. Moreover these pollutants were produced in the winter months when weather conditions were adverse. Although the replacement of old fashioned grates burning bituminous coal by improved open grates burning smokeless fuel was seen as the easiest and least expensive way to get smokeless domestic combustion, it ignored sulphur dioxide and more efficient methods. This, thought Mr. Smith, was almost certainly a mistake. Although it was expected that progress would be gradual, it fell well below the planned rate and in 10 years little more than one third of the premises in black areas had been brought under control. The Beaver Committee had hoped that smoke would be reduced in heavily polluted areas by 80 per cent in 10 to 15 years.

Mr. Smith discussed pollution from transport in three parts—railways, ships in inland waterways and motor vehicles. Railway smoke was a fast diminishing problem; ships presented some problem but this was more of a minor nuisance. But motor transport was a major problem. The root cause in the cases of both diesel and petrol engines was the same—incomplete combustion.

Diesel smoke was objectionable, but there was a cure for this in proper maintenance of the engine and the correct setting of the maximum fuel stop. Legislation covered this problem and appeared to be adequate; the difficulty now was enforcement of the Law.

The petrol engine was a more difficult matter as only rarely was combustion complete. There were two aspects of the problem; crankcase fumes and exhaust gases. Most British cars are already fitted with crankcase devices and it seemed likely that this would soon be made compulsory by Law.

The most likely solution for the exhaust gas problem seemed to lie with fuel injection and modified carburettors. There had been considerable cooperation with European countries and the way was now open for legislation. But modifying cars was only part of the problem. Pollution from motor vehicles was essentially a town concern of congested streets and idling engines. Wider issues were involved: notably the movement of traffic in towns, town planning and the use of different types of vehicle.

**Which?**, journal of the Consumers' Association, included in its January, 1968 issue, a report on electric storage heaters. There are now close to $1\frac{3}{4}$m. storage radiators in use in Britain, and the demand is continuing to increase, so that an impartial assessment of this method of heating is of importance to many people. The report deals with the different types and makes of storage heater, their characteristics and performances, and deals with installation and running costs, etc. For this survey 25 makes of medium size ($2\frac{1}{2}$ kW or near) were tested, out of which two "best buys" were chosen, with a further seven listed as good value for money. The variations between different makes are considerable and a study of this report is recommended to any prospective purchasers of this range.

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### Electro-Heat Congress

Around 800 delegates, many of them from overseas, are expected to attend the VIth International Congress on Electro-Heat (U.I.E.) at the Metropole Hotel, Brighton, from 13-18, May 1968. The Congress, which is being held in Britain for the first time, is organized by the British National Committee for Electro-Heat on behalf of the U.I.E. It is open to everybody interested in electro-heat techniques, and is not restricted to the 19 member countries of the U.I.E.

A booklet giving information on the Congress programme, together with registration forms, can be obtained from the Congress Office, U.I.E. 6, Trafalgar Buildings, 1 Charing Cross, London S.W.1.

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### Noise Congress

The Noise Abatement Society is organizing for the International Association against Noise, an International Congress for Noise Abatement to be held in London, at the Queen Elizabeth Hall, from 13 to 18 May, 1968. Registration forms and programmes, etc., may be obtained from the Noise Abatement Society, 6/8 Old Bond Street, London W.1.

# five recommended solid smokeless fuels for domestic solid fuel appliances

consult your Gas Board regarding availability of these recommended fuels

*Correspondence*

# Is Smoke Control Worthwhile?

*The Editor*
*Smokeless Air*

Dear Sir,

To what extent do you and your members seriously consider the establishment of Smoke Control Areas worthwhile?

No doubt this will be regarded as a supremely fatuous question in this day and age, when the policy of clean air has full Government support, and more and more local authorities are creating more and more smoke control areas.

But the establishment of such areas is not to be regarded as an exercise for a local authority to demonstrate its financial resourcefulness, or its technical and administrative expertise; nor as the creation of a prime market for appliance dealers and fuel distributors, or as a means of assisting in the modernization of domestic heating methods.

No! Clean Air alone prompts the initiation and continuance of a programme, and to ensure the permanency of the object regular surveillance of operative areas is not only desirable, but regrettably essential, and resort to legal proceedings against recalcitrant occupiers is necessary in some cases. This could be considered as the ultimate deterrent, not only to those prosecuted but also to serve as a warning to others; but such can hardly be said to be the case!

Two cases were to-day taken before the local Magistrates, the summonses being against two occupiers of houses within an area which has been operative for over five years. Both pleaded guilty! Each was fined £1!

One further case was taken against the occupier of a commercial undertaking within an area which had been operative over two years. The Occupier did not put in an appearance in Court, the case was proved, and he was fined £1!

Such is the extent of the support given to the pursuance of a national policy, and the reward for the diligent application of effort and expense! Such is the proof of the lip service only paid by the public, whose opinion is expressed through the judiciary! Such is the degree of deterrent in this age of relative affluence and devaluation.

I repeat, Sir, is it worth it?

Yours faithfully,
J. ARDLEY
Medical Officer of Health
*Public Health Office*
*Blackburn*

# *Total Energy*

An interesting new concept that is creating attention—and in the United States, action—is what is termed Total Energy. It is of particular interest, for reasons that will be apparent, to the gas industry. It is based on the use of a single fuel to supply all the energy needs, including electricity, for a house or other building, or group of buildings. If gas is the fuel used it could supply heat direct and also generate electricity for power, lighting, and other purposes, by means of a fuel cell or more conventional means. Apart from this particular use, the fuel cell itself has great potentialities—it is a means for generating electricity directly from a chemical reaction. One British firm has recently demonstrated a unit which, using natural gas, generates 5 kilowatts of electricity, enough for up to five houses, and is now working on a 100 kW. unit for blocks of flats. Waste heat from the generator can be used for heating or air conditioning, and it is claimed that the fuel can be used at 70 per cent efficiency compared with the 40 per cent from a modern generating station.

A paper on the subject was read recently to the Institution of Gas Engineers by an American, C. J. Gauthier, in which reference was made to 337 "T/E" plants already in operation in the U.S.A. It is estimated that in 72,000 existing and projected buildings over the next five years the system could be economically feasible.

The crux of the matter is of course its cost, compared with conventional methods, and on this Mr. Gauthier has a full and interesting discussion in his paper. One example of cost that has been quoted is the Sheraton O'Hare Inn at Chicago, which generates its electricity from four 12-cylinder engines burning natural gas, and says it is saving £5,000 a year by dispensing with mains electricity.

Other criteria to be taken into account are discussed by the author, and include that of air pollution, and especially the elimination of sulphur dioxide. The system clearly has possibilities, expecially for new developments, but any taking over from existing electricity supplies would seem to raise complex economic questions at a national level that might not be easy to resolve.

### British Council Course

The British Council and the Imperial College of Science and Technology are organizing a course on Control of Air and Water Pollution in London from 15 to 27 September 1968. Such courses are primarily for overseas members, but for this 15 British members will be accepted. The fee, which includes hotel accommodation and board, lecture and travel during the course, is £80. Full information may be obtained from the Director, Courses Department, British Council, 65 Davies St., London W.1.

### Smoke Control Objection

A full scale public inquiry will have to be held in St. Helens because of a single objection to a proposed smoke control order, which will delay the implementation of the order by several months. The objector is reported to be opposing the order because he still has a privy midden, and thinks that flush toilets are more important than smoke control.

CLEAN

To the Central Electricity Generating Board, smoke means more than impure air. It means unburnt carbon, wasted power.

At modern coal-fired power stations, over £3,500,000 is spent on clean air measures —tall chimneys and dust extraction plant.

**Better — cleaner — things are electric**

# Report From Warren Spring

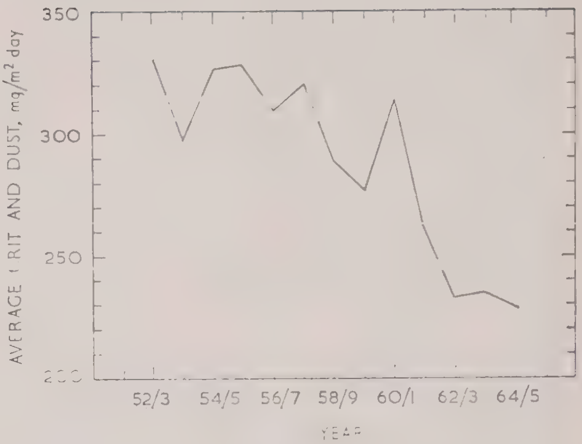
**Warren Spring Laboratory Report for 1966. pp 74. H.M.S.O. 8s. 6d. net.**

The new report reviews the extensive and very varied, work being carried out at Warren Spring. Following reports by the Steering Committee and the Director, Dr. C. C. Hall, there are reports on the various divisions of the laboratory: chemical engineering, mineral science and technology, chemical processing, air pollution, human sciences (ergonomics), together with notes on engineering and analytical services and engineering.

The section dealing with air pollution is an informative survey of the work and observations reported more fully in the separate report on the *Investigation of Atmospheric Pollution* (see *Smokeless Air*, No. 143, Autumn, 1967, p.28).

One of the most illuminating sections is on trends in pollution by smoke and sulphur dioxide. The important reductions in smoke emission that have taken place in recent years are cited: for smoke, at sites outside London, a decrease, since 1958-59, averaging about 25 per cent in ground level concentration, and in London a decrease in both emissions and ground-level concentration to about one-third of that ten years ago.

Emission (calculated) of sulphur dioxide outside London has increased steadily, and in 1965 was about 25 per cent higher than in 1952, but ground-level concentrations, since 1958-59 have decreased by about 25 per cent. The increase of emission is due to increased electricity generation (with tall chimneys and sited away from towns), and the decrease at ground level is attributed to a decrease in low-level domestic emissions. In London emission of sulphur dioxide has increased by 30 per cent since 1952, but ground level concentrations have not increased (see also the G.L.C. report, quoted on another page).



*Grit and dust fall at industrial sites in Britain, 1952-3 to 1964-5. From the Warren Spring Report.*

Grit and dust—which is regarded as those particles large enough to fall out of the air under their own weight—have also decreased considerably in recent years, as the accompanying figure, from the report, shows. This is for industrial sites, and the decrease is down to about three-quarters of what it was between 1952 to 1958.

The effect of smoke control on pollution levels is being studied, especially in districts of older houses formerly fairly heavily polluted.

"Where pollution was measured in such a district", says the report, "before and after the introduction of smoke control, and where results were available from another similar district nearby which had remained uncontrolled, it was shown that smoke concentrations could be reduced by as much as 45 per cent after smoke-control measures had been put into effect; in no case did sulphur dioxide increase, and in fact reductions of up to 20 per cent were found."

**April Episode**

Reference is made to observations in London that have shown that periods of exceptionally high pollution can occur at times other than in winter smog. An example is given of a case where, during a period in April, 1965, of settled anticyclonic weather, with clear skies and warm sunny days, the sulphur dioxide concentration rose on two occasions to above 1500 $\mu$gm/m$^3$. The peaks coincided with peak demands on the Emergency Bed Service. Smoke concentrations were not high and there was little domestic heating, though central heating was still in operation.

Another section of the report discusses pollution in relation to high buildings. Measurements of smoke and sulphur dioxide have been made at different floors and on different faces of two tall buildings in London. Pollution was often found to be greater at one floor than another, and one face rather than another, but no consistent difference with height or wind direction could be found. One building, with an oil-fired heating plant and short chimney on the roof was found to have sulphur dioxide concentrations of the order of a few thousand micrograms outside the windows of the penthouse. It is concluded that care must be taken in the design and location of chimneys serving the heating systems of individual buildings of this type. Apart from this nothing was found to support fears that tall buildings may be subject, even occasionally, to higher levels of pollution than shorter ones.

Studies of diffusion in cities, the dispersion of chimney gases, and pollution from motor vehicles, are also discussed. Observations taken over a period of several months in the congested main street of a large provincial town have produced no evidence of any excessively high concentrations of carbon monoxide. Measurements are now being extended to other towns and cities.

Considerable effort is being devoted to the development of an accurate and reliable instrument for continuous monitoring of sulphur dioxide. The instrument used is based on the measurement of the electrical conductivity of the sulphuric acid formed by collecting sulphur dioxide from an air stream by impingement on the surface of hydrogen peroxide solution in a small electrolytic cell. A certain amount of error has been found with prototype instruments, and work is proceeding to identify and remove the sources of such error.

# Papers on Pollution and Health

## ENVIRONMENT, HOUSING AND HEALTH

A paper with this title, by Dr. A. E. Martin, a Senior Medical Officer of Health, Ministries of Health and Housing and Local Government, was published last year in *Urban Studies* (4 Feb., 1967, No. 1). The paper discusses the factors affecting health that are associated with environment and housing conditions. On bronchitis it is pointed out that the role of tobacco smoking and air pollution has only recently been fully appreciated. Many studies have been carried out demonstrating the effects of cigarette smoking, but the effects of air pollution have been difficult to assess.

"Physical measurements", says the author, "indicate that it is pollution from domestic chimneys which is more important than industrial emissions on account of the lower height and temperature at which the former is discharged, and areas of dense old-fashioned housing in which emissions are not yet controlled under the Clean Air Act, are usually the most heavily polluted areas in cities."

Again: "Modern knowledge on air pollution must be considered in relation to housing density, fuel consumption and the presence of other factors in the community such as increased incidence of respiratory infections, which may aggravate the effects of the pollution."

The author's own summary may be quoted, and the conclusion expressed in paragraph 5 will be noted:

1. During the past century a large number of studies have been undertaken indicating the influence of poor environment and bad housing on health.
2. In spite of the advances of epidemiological techniques there are serious difficulties in methodology and the results must therefore be interpreted with care.
3. The findings of such studies are true only for the social economic and medical conditions under which they were made.
4. Although many of the effects of bad environment appear to be diminishing there may be isolated groups in the community where the effects may be more serious than may be apparent from community health indices.
5. The evidence shows the clear association of health with socio-economic conditions, overcrowding and air pollution. When these are eliminated the influence of other factors is slight.
6. Advances in medical treatment are having a specific effect in reducing the association between certain medical conditions and poor environment.

## LUNG CANCER AND BRONCHITIS

*Lung Cancer and Bronchitis in Relation to Cigarette Smoking and Fuel Consumption in Twenty Countries* is the full title of a paper by P. Stocks in the *British Journal of Preventive and Social Medicine* (21, No. 4, Oct. 1967). Starting with reference to judgments that although cigarette smoking is a cause of lung cancer there are also other causes, the author points out that if, out of the 30,000 deaths from this disease in the U.K. every year, only one-fifth are due to other causes—and the fraction may be greater than this—then the other factors account for 6,000 deaths, which could hardly regarded as unimportant.

The paper reviews studies on the excess of urban over rural death rates from lung cancer and describes an examination of lung cancer deaths and of solid and liquid fuel consumption per head in different countries.

It was found that "whereas cigarette consumption was correlated more strongly with the rates at younger ages than at more advanced ages, the relation with solid fuel became most evident at ages after 55 when it was even stronger than with cigarettes. With liquid fuel consumption, however, associations were negative. Consumption of coal appeared to account in the average country for about one-third of the deaths and that of cigarettes for about two-thirds."

A statistical discussion, with tables and figures, then follows, and the summary of conclusions is as follows:

"These rules suggest that, while cigarette smoking is the most important factor in determining national death rates of men from lung cancer before age 45, air pollution by coal smoke is as important as cigarette smoking in determining the rates at ages over 55, and that the two factors are sufficient to account for the rate variation in twenty countries, except in Finland, Austria, and the Netherlands, where additional unknown factors seem to be operating."

---

### Chimneys for Oil-fired Plant

Shell-Mex and B.P. Ltd. have issued a new edition of their 40-page booklet, *Chimneys for Industrial Oil-fired Plant*, which is a very useful practical handbook on the height and design of chimneys for efficiency and compliance with the Clean Air Act and the Alkali Act. The booklet will be of value both to industrial concerns and to local authority inspectors. It is obtainable from Shell-Mex House, Strand, London W.C.2., or regional offices of the company.

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*Issued by the Electricity Council, England and Wales*

# SMOKE CONTROL AREAS

## Progress Report

### Position to 1 January 1968—TOTALS

| | England | Wales | Scotland |
|---|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation . . . . . . . . | 44 | — | 1 |
| *Acres*, 3,400 . . . . . . . . | | | |
| *Premises*, 41,060 . . . . . . | | | |
| **Smoke Control Areas in Operation** | 2,393 | 6 | 102 |
| *Acres* . . . . . . . . . . | 596,977 | 418 | 43,297 |
| *Premises* . . . . . . . . | 3,189,601 | 2,352 | 269,905 |
| **Smoke Control Orders** | | | |
| *Confirmed* . . . . . . . . | 210 | — | 11 |
| *Submitted* . . . . . . . . | 97 | — | 10 |
| **Grand Totals** . . . . . . | 2,744 | 6 | 124 |

### Summary of Progress as at 1 January 1968

| (1) *Region* | (2) *No. of black area acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage* of total black area acreage in region so covered* | (4) *No. of black area premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage* of total black area premises in the region* |
|---|---|---|---|---|
| Northern . . . . | 23,820 | 19·01 | 115,289 | 20·85 |
| Yorkshire and Humberside . . | 128,643 | 34·16 | 441,220 | 37·78 |
| East Midlands . . | 39,933 | 13·95 | 129,736 | 25·35 |
| Greater London . . | 194,959 | 59·61 | 1,737,000 | 65·81 |
| North Western . . | 135,874 | 33·87 | 620,285 | 36·43 |
| West Midlands . . | 66,652 | 26·77 | 287,863 | 27·38 |
| South Western . . | 7,201 | 27·33 | 26,650 | 17·89 |
| Totals (black areas) | 597,082 | 33·66 | 3,358,043 | 43·19 |
| Outside black areas (all parts) . . | 107,822 | | 366,474 | |
| GRAND TOTALS | 704,904 | | 3,724,517 | |

* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country).

*Note*

Statistics in respect of Wales and Monmouthshire are no longer included.

# NEW SMOKE CONTROL ORDERS

*The lists below are supplementary to the information in the last issue of "Smokeless Air" (Winter 1967) which gave the position up to 1 October, 1967. They now show changes and additions to 1 January, 1968.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.*

## ENGLAND

## NEW SMOKE CONTROL ORDERS IN OPERATION

**Northern**

*Tyneside and Wearside*

Boldon U.D. Nos. 1-3.

*Teeside*

Hartlepool B. No. 3. West Hartlepool C.B. No. 6.

**Yorkshire**

*West Riding (North)*

Baildon U.D. No. 9. Batley B. No. 6. Leeds C.B. Nos. 64 and 65.

**North Western**

*South Lancashire and North-East Cheshire*

Atherton U.D. No. 3. Failsworth U.D. No. 6. Oldham C.B. Nos. 11-14. Radcliffe B. No. 4. Rochdale C.B. (Falinge and Spotland). Royton U.D. (No. 3 Thornham). Salford C.B. No. 13. Stretford B. No. 10.

*Central Lancashire*

Accrington B. Nos. 1, 2, 4 and 5. Colne B. No. 5. *Preston C.B. No. 17. Preston C.B. Nos. 18-20.

*Merseyside*

St. Helens C.B. No. 5.

**Midlands**

*Derby, Nottingham and Chesterfield*

Carlton U.D. No. 2. Derby C.B. Nos. 7-10. Sutton-in-Ashfield U.D. No. 2.

*North Midlands*

Leicester C.B. Nos. 17 and 18.

*West Midlands*

Bedworth U.D. No. 1. Birmingham C.B. Nos. 88, 139, 141-143. Wolverhampton C.B. No. 6.

*West Riding (South)*

Darton U.D. Nos. 7 and 8. Sheffield C.B. Nos. 13 and 20.

**London**

*Greater London Boroughs*

Brent L.B. No. 4. Bromley L.B. Nos. 4-6. Ealing L.B. No. 30. Greenwich L.B. (Blackheath Park). Haringey L.B. (Tottenham No. 7). Haringey L.B. (Hornsey No. 9). Haringey L.B. (Wood Green No. 10). Havering L.B. No. 3. Hounslow L.B. (Feltham No. 7). Hounslow L.B. (Brentford and Chiswick No. 8). Hounslow L.B. (Heston and Isleworth No. 11). Merton L.B. Nos. 5 and 6. Richmond-upon-Thames L.B. (Richmond No. 8). Richmond-upon-Thames L.B. (Twickenham No. 6). Southwark L.B. Nos. 19-22.

*Outer London*

Dartford B. (Temple Hill South). Dartford B. (Area No. 6).

**Local Authorities Outside the Black Areas**

Brentwood U.D. No. 6. Exeter C.B. (Whipton No. 1). Exeter C.B. (Carlyon Gardens). Hemel Hempstead B. (Chaulden No. 1). Oxford C.B. No. 6. Southampton C.B. No. 5. Whitley Bay B. No. 3.

## NEW ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*

Boldon U.D. Nos. 6 and 7. Hebburn U.D. Nos. 8-10. South Shields C.B. No. 2.

**Yorkshire**

*West Riding (North)*

Aireborough U.D. No. 22. *Bradford C.B. (West Bowling). Leeds C.B. Nos. 67 and 69. Pudsey B. No. 6. *Rothwell U.D. No. 12. Stanley (Durham) U.D. (East Stanley No. 1). Stanley (Durham) U.D. (Lintz No. 1). Wakefield C.B. (Horbury Road No. 1). Wakefield C.B. (Thornes Lane No. 1).

*West Riding (South)*

Rotherham C.B. (Kimberworth No. 1). Rotherham C.B. (Redscope) Rotherham C.B. (Herringthorpe No. 4).

**North Western**

*South Lancashire and North-East Cheshire*

Ashton-under-Lyne B. No. 8. Bolton (Top o' the' Moss). Chadderton U.D. No. 9. Droylesden U.D. No. 12. Dunkinfield B. No. 8. (Armadale). Dunkinfield B. No. 12. Farnworth B. No. 3. Leigh B. No. 7. Middleton B. (Hollin Lane No. 11). Middleton B. (Whittle Lane No. 12). Middleton B. (Rhodes Green No. 13). Middleton B. (Top of Middleton No. 14). *Oldham C.B. No. 10. Salford C.B. No. 15. Stockport C.B. (Portwood/Newbridge Lane). *Tottington U.D. No. 1. Tyldesley U.D. No. 1. Whitefield U.D. No. 8.

*Central Lancashire*

Barrowford U.D. No. 1. Blackburn C.B. No. 8. Darwen B. No. 3. Nelson B. No. 3.

*Merseyside*

Bebington B. No. 20. Ellesmere Port B. No. 8. St. Helens C.B. No. 5A. Wallasey C.B. (Saughall). Warrington C.B. Nos. 11 and 12.

**Midlands**

*Derby, Nottingham and Chesterfield*

Alfreton U.D. No. 1. *Derby C.B. No. 12. *Derby C.B. No. 13. Kirkby-in-Ashfield U.D. Nos. 1-4. *Mansfield Woodhouse U.D. No. 1. *Sutton-in-Ashfield U.D. No. 3.

*West Midlands*

Birmingham C.B. No. 91. Birmingham C.B. No. 125. Birmingham C.B. Nos. 144-147. *Coventry C.B. No. 9. Dudley C.B. No. 50. Halesowen B. No. 28. *Halesowen B. No. 29. Sutton Coldfield B. No. 10. Walsall C.B. No. 12.

*Potteries*

Newcastle-under-Lyne B. No. 7. Stoke-on-Trent C.B. Nos. 18-20.

**SOUTH WEST**

*Bristol*

*Bristol C.B. No. 8.

**London**

*Greater London Boroughs*

Barnet L.B. No. 6. Brent L.B. No. 5. Ealing L.B. Nos. 33 and 34. Enfield L.B. No. 15. Greenwich L.B. (Charlton). Harrow L.B. No. 15. Islington L.B. Nos. 26 and 27. Kensington and Chelsea L.B. (Brompton/Queen's Gate). Kingston-upon-Thames L.B. No. 13. Lambeth L.B. No. 20. Redbridge L.B. No. 14. Richmond-upon-Thames L.B. (Barnes No. 9). Tower Hamlets L.B. No. 4. Waltham Forest L.B. No. 12. Wandsworth L.B. No. 2. Westminster L.B. (Queen's Park). Westminster L.B. (Maida Vale North).

**Local Authorities Outside the Black Areas**

Bedford B. No. 4. Blaby R.D. No. 4. *Crewe B. No. 4. Glossop B. Nos. 1 and 2. Hale U.D. No. 1. Hazel Grove and Bramhall U.D. No. 3. Heanor U.D. No. 3. High Wycombe B. No. 15. Meriden R.D. No. 2. Rugby B. No. 7. *Skipton U.D. No. 5. Thurrock U.D. No. 5. Waltham Holy Cross U.D. Nos. 2-4. Watford B. Harwoods No. 6. Watford B. No. 7. Winsford U.D. (Wharton Road West) No. 9.

## NEW ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Tyneside and Wearside*

Newcastle-upon-Tyne C.B. No. 12. Tynemouth C.B. No. 7.

*Teeside*

Hartlepool C.B. Nos. 11 and 12. Middlesbrough C.B. (The Avenue, Keith, Regent, Sutton).

**Yorkshire**

*West Riding (North)*

Bradford C.B. (Listerhills). Brighouse B. No. 13. Heckmondwike U.D. No. 7. Horsforth U.D. No. 26. Leeds C.B. Nos. 68 and 70. Mirfield U.D. No. 9. Shipley U.D. No. 9. Sowerby Bridge U.D. Nos. 5 and 6 Stanley (Yorks) U.D. No. 2.

*West Riding (South)*

Barnsley B. No. 4. Conisbrough U.D. No. 1. Mexborough U.D. No. 1. Sheffield C.B. No. 26.

**North Western**

*South Lancashire and North-East Cheshire*

Atherton U.D. No. 4. Bury C.B. No. 7. Dunkinfield B. No. 14. Failsworth U.D. No. 7. Golborne U.D. No. 1. Hyde B. No. 5. Irlam U.D. No. 3. Stalybridge B. (Copley, Millbrook, Carrbrook, Harridge) Stretford B. No. 12. Wigan C.B. No. 4. Worsley U.D. No. 5.

*Central Lancashire*

Colne B. No. 6. Darwen B. No. 3A.

*Merseyside*

Birkenhead C.B. No. 6. Liverpool C.B. No. 27. Runcorn R.D. No. 2A. Warrington R.D. No. 1. (Winwick).

**Midlands**

*Derby, Nottingham and Chesterfield*

Beeston and Stapleford U.D. No. 9. Chesterfield B. No. 5. Chesterfield R.D. No. 10. Sutton-in-Ashfield U.D. No. 4.

*West Midlands*

Aldridge-Brownhills U.D. No. 27(a). Solihull C.B. Nos. 14 and 15. Stourbridge B. Nos. 26 and 27. West Bromwich C.B. No. 17. Wolverhampton C.B. No. 13.

*Potteries*

Kidsgrove U.D. Nos. 14 and 15. Stoke-on-Trent C.B. No. 17.

**London**

*Greater London Boroughs*

Bexley L.B. No. 8. Ealing L.B. No. 35. Harrow L.B. No. 16. Havering L.B. No. 4. Hounslow L.B. (Feltham No. 8). Hounslow L.B. (Heston and Isleworth Nos. 12 and 37. Hounslow L.B. (Brentford and Chiswick No. 9). Merton L.B. No. 8. Newham L.B. No. 5. Richmond-upon-Thames L.B. (Twickenham No. 7). Sutton L.B. No. 17. Waltham Forest L.B. No. 13.

*Outer London*

Dartford R.D. (Bean). Dartford R.D. (Swanley West).

**Local Authorities Outside the Black Areas**

Luton C.B. No. 6. Scunthorpe B. No. 7. Seisdon R.D. No. 2. Skelmersdale U.D. No. 3. Staines U.D. No. 9. Stokesley R.D. (Hemlington Park). Tamworth B. Nos. 1 and 2. Whitley Bay B. No. 4. Wilmslow U.D. No. 12.

### WALES

### NEW SMOKE CONTROL ORDER IN OPERATION

Mold U.D. No. 2.

### SCOTLAND

### NEW SMOKE CONTROL AREAS IN OPERATION

Barrhead No. 2. (Auchenback). Coatbridge (Rosehall and Whifflet). Dumbarton Burgh Nos. 6, 7 and 8. East Kilbride (East Mains, Calderwood and Southern Extension). Edinburgh (Murrayfield/ Cramond) No. 2. Falkirk No. 5. Galashiels (Langlee, Melrose Road). Glasgow (Camphill, Langside and Govenhill). Hamilton (Hillhouse No. 1.) Lanark County (Burnside (Remainder) and Cambuslang). Renfrew Burgh No. 3. Rutherglen (Stone law). Stirling County (Bannockburn No. 2).

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Clydebank No. 6. (Parkhall). Port Glasgow Nos. 2 and 3. Renfrew Burgh No. 4.

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

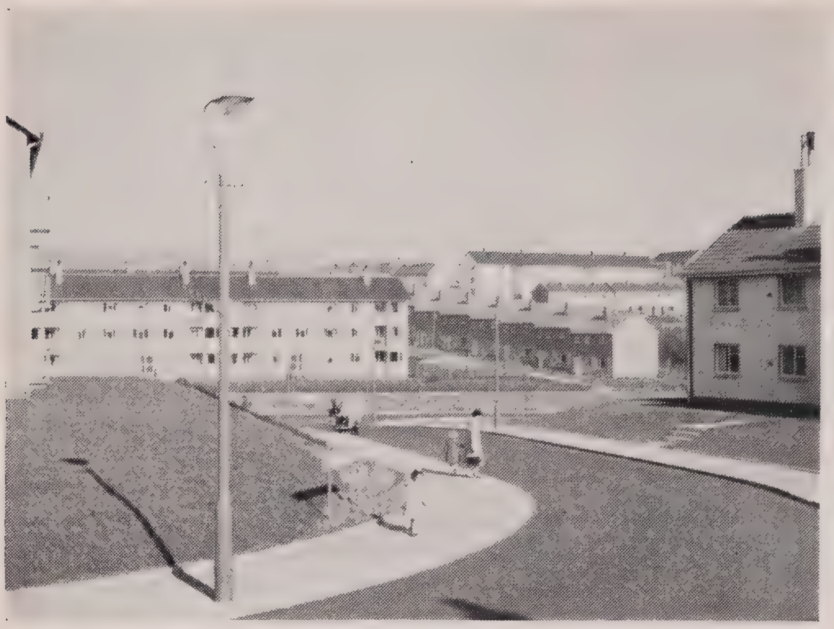
Denny and Dunnipace No. 1. Paisley (Hunterhill)

## LONDON'S FALLING POLLUTION

The 1966 Annual Report of the Scientific Adviser, Greater London Council, discusses air pollution and indicates how not only smoke, but now also sulphur dioxide, is diminishing. To quote:

Averaged results for 1966 from seven representative sites in inner London indicated a yearly average smoke concentration of 65 $\mu$gm/m$^3$, representing a reduction of 14 per cent since the previous year.

Measurements of sulphur dioxide by the daily volumetric method at the seven sites mentioned in the previous paragraph indicated a yearly average concentration in 1966 of 17 $\mu$gm/m$^3$, showing a reduction of 11 per cent a year earlier. Following upon a reduction of 14 per cent a year earlier, this result suggests that a downward trend in the pollution of the air of London by the consumption of sulphur-containing fuels is at last in evidence.



*East Kilbride*

# *Scotland's First Smokeless Town*

The Burgh of East Kilbride became completely smoke controlled on 1 November, 1967, and is the first town in Scotland to achieve this. East Kilbride is largely a new town, but even so determination to secure full freedom from smoke had to be maintained after a start had been made in 1961. There are now 15,785 houses under smoke control, and it is interesting to note that there were no objections throughout. It is reported that "a tremendous difference was seen after orders came into operation, with low level smoke eliminated completely".

An appropriate celebration was held in the town, in the form of a luncheon on 14 December, with Councillor William Niven, Convenor of the Health and Welfare Committee in the chair. There was an address of welcome to the guests by Provost John Wright, to which Arnold Marsh, as Director of the National Society for Clean Air, responded. He congratulated the Burgh on its achievement and hoped it would be soon emulated by other Scottish towns and cities. A vote of thanks was moved by Councillor G. A. Snodgrass, of Glasgow, speaking as Chairman of the Clean Air Council for Scotland. The Press was present and the occasion helpfully gave Press publicity that is to be welcomed.

### English Programmes Completed

We have been glad to report the useful way in which East Kilbride announced and celebrated its completion of smoke control, and would enter a plea that other local authorities should do the same. This is not wanted for any reason of pride or self-congratulation, but because such occasions deserve publicity in their own right and particularly because the publicity will stimulate interest generally and encourage other authorities to make better progress. For our part we wish to record completion in this journal and to list them in the *Clean Air Year Book*.

It was disappointing for example for us to learn—after inquiry—that the London Boroughs of Hammersmith* and Hackney had both completed their programmes in 1967, and that neither had said a word about it.

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* We learn that one of Hammersmith's Smoke Control Orders has been temporarily suspended.

Will local authorities who will be doing the same before long please note?

This year we have news that two authorities in the North-west are to complete—Cheadle and Gatley, and Whitefield, in March and October respectively.

It may be mentioned that apart from the special case of the City of London, which became a complete smokeless zone under an Act of its own, in 1955, two other London authorities completed their programmes some time ago—Stoke Newington and Holborn—but both are now incorporated in new London Boroughs that are otherwise not yet smokeless.

Quite a number of authorities, as listed in the *Clean Air Year Book*, are due to complete during the next five years or so, but as many readers will have noted, there are several, particularly in the West Midlands, that are aiming for dates in the 1980s: the record being held by Solihull, which gives 1989!

# *A Forecast from the Past*

We are indebted to the President for showing us the October-November number of the *British Mercedes and Benz Club Gazette*, which reprints an article first published in *Motoring for the Million* in 1922. Entitled "A Dream of 1950", it is a forecast of roads and motor traffic at that then distant date. Some of the prophecies have not happened, and never will, but others have come about, while some are still being sought after.

Thus the writer in his dream found that "self starters of sorts were fitted to every car as I saw no one starting up cars by hand", and "noises from gear changing had been overcome, as the gearbox as understood in our day was non-existent". And "nobody carried spare wheels, which told me that tyre troubles were passed". "Fuel, I learned, was of trifling cost, whether petrol, paraffin, alcohol or electricity . . . for private vehicles electricity was largely used".

Again: "There were many electric cars; they were lighter than we know them, were as fast as other types and recharging stations were in every street. Also, incidentally, recharging was a simple operation as batteries were everywhere interchangeable."

But the paragraph of most interest to us in this vision was on air pollution:

> "Fuel purity, more perfect combustion, and an ingenious invention in the exhaust boxes had the effect of leaving the air in a much purer condition than it had been ever since the motoring movement began. In fact, I was told that about 1930 so horribly had carbon dioxide and other exhaust gases from motor vehicles poisoned the air of cities, that the health of the community had been greatly endangered. Thus the Government, in defence of the people, had to find ways of obviating this, and offered handsome prizes for inventions to this end. In this advanced age no oily, smoky, or smelly odour was tolerated under any circumstances whatever, and so living in town was just as healthy as living in the country."

In one respect the author, a Mr. Leslie Henslowe, was regrettably very much off the mark: "Accidents to pedestrians were very rare as they had learned that caution was the essence of safety. Motor accidents were also of rare occurrence; brakes on all wheels were largely the reason for greater security."

And the author could not foresee how limited in its application could this prove to be: "Servants were required to be able to drive as part of their curriculum".

# NEW MOBILE S.S.F.F. EXHIBITION

Sir John Charrington, who is chairman of the National Federation of Coke Distributors' Associations, opened a new mobile exhibition, and unveiled a plaque commemorating the presentation of the exhibition to the Solid Smokeless Fuels Federation, at a gathering in London on 19 December, 1967. Among others present on the occasion were Mr. R. Freeson, M.P., Parliamentary Secretary, Ministry of Power, Sir David Pitblado, Permanent Secretary, Ministry of Power, and Sir Henry Jones, Chairman of the Gas Council.

The new Mobile Exhibition is the fifth to be operated by the Federation in Smoke Control Areas, where they are used with the co-operation of the local authorities to advise the residents on suitable appliances and fuels for use in smoke control areas. The new Mobile Exhibition is already booked for six months ahead and will commence a tour organized in conjunction with the Warwickshire Clean Air Council visiting Coventry, Rugby, Nuneaton and other local authorities.

*Sir John Charrington and Sir Frederick Scope, Chairman of the S.S.F.F., at the presentation ceremony.*

The unit which is built on a Bedford Chassis, is 30 ft. long x 8 ft. wide and has three appliances under fire—an ordinary approved open fire, a fan assisted open fire and an inset roomheater, which will also be heating radiators. A section of the exhibition will be devoted to smokeless fuels and another section to central heating.

THIRTY-FIFTH

# ANNUAL CONFERENCE

With the Clean Air Exhibition

# HARROGATE

## 22-25 October 1968

*The Programme will include sessions on*

- Clean Air and Future Fuel Usage
- Measurement of Pollution and Report on the National Survey
- Road Vehicles: Papers on Reduction of Petrol Engine Pollution; Progress with Electric Vehicles; the Warwick Pollution Investigation
- Chimneys: Papers on Design, Height and the Aesthetic Factor
- Smoke Control and its Practical Problems
- With Technical Visits, Ladies' Programme, Civic Reception, Conference Dinner

The full programme, invitation notices, and registration forms will be issued in May, but registrations can be accepted from now. Details from the Director, N.S.C.A., Field House, Breams Buildings, London E.C.4 Tel: 01-242 5038

*An illustration of the burning of waste material in the open, from the Coventry Health Report for 1966.*

## DIVISIONAL NEWS

A meeting of the **South East Division** was held in the Caxton Hall, Westminster, on 28 February. The principal part of the programme was an address by the Deputy Chief Alkali Inspector, J. Beighton, on "Grit and Dust—with reference to the report of the Working Party". It is hoped to give a full report of this address and the discussion in the next issue.

As this was the last meeting of the Division before the retirement of the Director, Arnold Marsh, O.B.E., at the end of May, he was invited to speak to the members and to introduce his successor, Rear Admiral P. G. Sharp, C.B., D.S.C.

The **Yorkshire Division** met in Leeds on 27 February, where following a meeting of the Council and lunch by invitation of the Yorkshire Electricity Board, an address was given by H. G. Mitchell on "Total Environmental Control". This included a description of modern research into ways of using waste heat from lighting, etc.

**The North East Division** will hold its annual meeting at the Roker Hotel, Sunderland, on 18 April, when there will be addresses on "The Future of Electricity Generation" and "Electricaire Installations", by speakers from the North Eastern Electricity Board. In the afternoon there will be a visit to multi-storey flats and maisonettes at Hendon to view Electricaire heating.

The **Scottish Division** will be holding its Annual Conference at Hawick, Roxburgh, on 23 and 24 May.

The Annual General Meeting of the **Northern Ireland Division** has been arranged for 19 March.

### Electric Car Development

The "Carter Coaster" electric car is being developed in co-operation with I.C.I., who are to design and develop a plastic body, using Marbon ABS plastic. Powered by an electric motor in each rear wheel, the car will at first give 50 miles on one battery charge, at a cost of ten miles a penny. Seating four, the car is expected to be sold at around £300, and should be in production in four to five months.

### A.P.C.A. Meeting

The annual meeting and conference of the Air Pollution Control Association of America will be held at St. Paul, Minnesota, from 23 to 27 June next.

# DEATHS FROM BRONCHITIS

The Beaver Committee in its Final Report gave figures to show how the bronchitis death rate varied according to size of town, and how the urban rate was in excess of the rural rate. These figures, though still frequently quoted, are today very much out of date. We therefore append the latest returns, based on data from the Registrar-General's Statistical Review for 1966. The tables show that not only does the urban excess still prevail, and that there is a marked disparity between the Northern and Midland rates on the one hand and the Southern rates on the other. The latter figures may be interestingly compared with the regional coal consumption figures given on page 170.

**England and Wales 1966**

| | *Males* | *Females* |
|---|---|---|
| Total deaths from bronchitis | 21,784 | 7,785 |
| Total deaths from all causes | 282,328 | 267,051 |

**Deaths according to type of area:**

| | *Total Deaths* | | *Standardized Mortality Ratios** | |
|---|---|---|---|---|
| | *Males* | *Females* | *Males* | *Females* |
| Urban conurbations | 8,434 | 3,305 | 117 | 121 |
| Urban areas outside the conurbations: | | | | |
| Population 100,000 or over | 3,167 | 1,130 | 118 | 116 |
| Population 50,000 or over & under 100,000 | 2,063 | 708 | 100 | 91 |
| Population under 50,000 | 4,696 | 1,533 | 95 | 88 |
| Rural Districts | 3,424 | 1,089 | 70 | 72 |

**Regional Distribution of Bronchitis Deaths**

| | *Total Deaths* | | *Standardized* Mortality Ratios** | |
|---|---|---|---|---|
| | *Males* | *Females* | *Males* | *Females* |
| Northern | 1,629 | 566 | 110 | 118 |
| Tyneside conurbation | 524 | 209 | 142 | 166 |
| Yorkshire and Humberside | 2,479 | 877 | 117 | 117 |
| West Yorkshire conurbation | 938 | 354 | 122 | 120 |
| Northwestern | 3,672 | 1,523 | 124 | 140 |
| S.E. Lancashire conurbation | 1,496 | 702 | 142 | 178 |
| Merseyside conurbation | 669 | 238 | 124 | 113 |
| East Midlands | 1,505 | 500 | 102 | 102 |
| West Midlands | 2,361 | 814 | 118 | 119 |
| West Midlands conurbation | 1,285 | 437 | 139 | 133 |
| East Anglia | 537 | 165 | 67 | 62 |
| South Eastern | 6,757 | 2,519 | 87 | 86 |
| Greater London | 3,522 | 1,365 | 99 | 99 |
| South Western | 1,370 | 414 | 74 | 63 |
| Wales I (South East) | 1,152 | 283 | 129 | 100 |
| Wales II (Remainder) | 322 | 124 | 79 | 86 |

* Death rate, adjusted according to sex/age distribution of the population of the area concerned, and expressed as a ratio to the corresponding rate for England and Wales (England and Wales equals 100).

# *Contributions to Cleaner Air*

## News from Industry

### INFORMATION ON NATURAL GAS

The increasing interest in natural gas in Europe, and all the effects which recent discoveries are likely to have on industries both directly and indirectly concerned, has led to an increasing demand for public information.

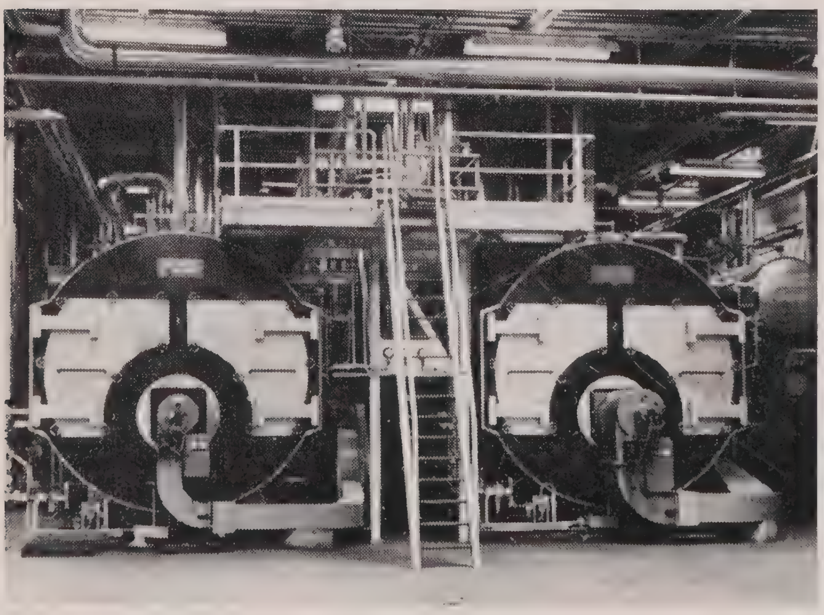
To meet this demand Cedigaz (Centre International D'Information Sur Le Gaz Naturel Et Tous Hydrocarbures Gazeux) has decided that its own information service should be made available to public subscription. Cedigaz operates on behalf of the major European gas interests, and its information bureau near Paris, publishes new extracts from 300 European publications in a multi-lingual bulletin, "Cedigaz-Actualites", which appears about every four days. Through the Gas Council, the British Gas Industry takes part in this service.

Further details of the services available to each type of subscriber may be obtained from the Secretary of the Gas Council (4/5 Grosvenor Place, London, S.W.1.) or from Cedigaz at 1 Avenue De Bois-Preau, 92-Rueil-Malmaison, Hauts-De-Seine, France.

### DUAL-PURPOSE 'OILORGAS' BURNERS

A new range of gas and oil burners —including a dual-purpose unit—is announced by Bigwood Unicalor Ltd., of Wolverhampton. They are suitable for use with industrial boiler installations where both gas and oil fuel are available, allowing users new flexibility to offset fluctuations in the supply or price of one particular fuel. Other applications are in hospital installations where oil may be used as an emergency fuel supply to a gas-fired boiler (a change-over can be effected in minutes) and in cases where a change to natural gas may be required in, say, 12 months' time when supplies are available.

Known as the Brumes TG Burners, these units are being manufactured by Bigwood under licence from Bronswerk-Fijenoord NV of Holland. Although there is a number of dual burners already available in Britain the Brumes is somewhat unique on the U.K. market in that it has been proved and developed in use on the Continent for a period of 10 years in conjunction with the big expansion in



*An "Oilorgas" installation, equipped for the use of either oil or gas.*

Dutch natural gas supplies. Spare parts are being distributed to depots in London, Wolverhampton, Leeds, Sheffield, Manchester, Nottingham and Glasgow, and Bigwood Service Engineers are already covering the whole of the country.

Three basic types of burner are being manufactured by Bigwood Unicalor—Type TG (gas), Type TM (oil) and Type TGM (oil or gas). Basic construction of the burners is the same for each type and complies with the safety standards of the Dutch Gas Institute and those laid down by the British Gas Council for forced draught burners. The oil burners are high pressure atomizing with the nozzle return oil pressure regulating fuel flow.

## G.W.B. MOBILE BOILER FOR SHEFFIELD

A completely self contained solid fuel fired mobile boiler, the first of its kind in the U.K. has been designed and built by G.W.B. Boilers Limited of Dudley for the Sheffield Regional Hospital Board. The boiler will have a steaming capacity of 12,500 lb. per hour and would be suitable for operating pressures of between 80 and 250 lb. per sq. inch. The boiler being mounted on specially designed trailer which also incorporates a feed tank, chimney, pneumatic coal handling plant and other essential services.

The boiler and trailer is complete with its own tractor unit and weighs 60 tons and has an overall length in excess of 50 ft.

Initially, the boiler will be used for one of the Board's Hospitals but can, within a few hours be diverted to any one of their 200 Hospitals should such an emergency arise.

## CENTRI SPRAY

Centri Spray Ltd. (Green Dragon House, High Street, Croydon) manufacturers, amongst other like equipment, of air washers, dust and chemical fume collectors and cupola dust collectors, recently held an interesting conference for technical journalists at their factory at White Waltham aerodrome, near Maidenhead. The party toured the factory, which is fitted out with up-to-the-minute machines, and saw for themselves the sort of work which the firm can do, and learned that although the factory has been in production for only 2½ years, plans are already in hand to enlarge it to cope with the present volume of business.

In the sphere of clean air, Centri Spray build air washers of the wet scrubber type in all sizes. They specialize in building "one-off" machines for specific tasks: they do not sell equipment "off the shelf" but make a special study of the particular problem and then build accordingly. They have installed air pollution control plants in a number of motor vehicle works in this country and on the Continent. One plant recently installed has a capacity in excess of 1,000,000 cfm. (1c). The machines are self cleaning and Centri Spray guarantee grit and dust extraction, including sub-micron particulate sizes, down to ·05 grains per standard cubic foot.

## NEW FACTORY FOR F. E. BEAUMONT

Appropriately enough, the first thing that guests saw on approaching Messrs Beaumont's new factory outside the small town of Mere in the rolling countryside of the Wiltshire-Dorset border was a shiny aluminium-clad chimney which was emitting no smoke into the clear, frosty air. Nevertheless, the chimney was working—not only as a chimney but also as a tank for fuel oil and as a header tank for hot water.

The factory was officially opened by Lord Margadale of Islay, T.D., D.L., J.P. on 8 February, 1968 in the presence of about 120 guests representing industries and authorities with whom Beaumont's have connections all over the country and from local organizations in the immediate vicinity of the factory. Lord Margadale, who was introduced to the guests by Mr. M. Beaumont, declared the factory open by operating in turn each of the machines used in the construction of steel chimneys. In his opening remarks he welcomed Messrs. Beaumont to Mere and was expecially gratified that 75 per cent of the labour force of the factory had been recruited locally and trained by the firm.

After an excellent luncheon, guests were given the opportunity of inspecting the factory and seeing for themselves the construction of a steel chimney from start to finish. The factory is spacious and designed for the job. Steel plates go in at one end; finished sections of steel chimneys come out at the other. Beaumont's estimate that it takes them about eight working days to construct a 200 ft. steel chimney, and given reasonable weather and site conditions, it can be erected in one or two days. The chimney sections up to 14 feet in diameter are transported from the factory on the firm's own road vehicles direct to the site. If the chimney is going abroad, the vehicles drive straight on to cross-channel ferries and the sections continue their journey without transhipment. This is important as Beaumont's have a growing export trade. At present 25 per cent of their products go to the Continent at a price at least 10 per cent below that of the chimney manufacturers of the Ruhr.

## NATURAL GAS CONVERSION PROGRAMME

The £400 million programme for converting Britain's 30 million gas appliances to operation on natural gas begins full-scale in seven Gas Board areas this year. Within twelve months it is planned that 600,000 of the 13 million gas consumers will be using the new gas. By 1971 the yearly conversion rate will have risen to between 1½ and 2 million customers per year and the whole task will take up to ten years to complete.

Plans for 1968 conversion work, which will be carried out by the individual Area Gas Boards or their contractors, have already been announced.

## GAS HEATING EXHIBITION

The latest series of exhibitions and demonstrations to be presented by the Industrial Division of North Thames Gas opened on the 28 November, 1967, under the title of 'Industrial and Commercial Heating'.

Great interest in natural gas, coupled with continuing demands for higher standards of comfort conditions at work, make this exhibition most appropriate at this time. Visitors will be able to see how a great number of manufacturers have responded to the opportunities created by the arrival of natural gas and have designed their equipment to accept it—universal burners have become the order of the day.

Less than two years ago, an exhibition entitled 'Factory Heating by Gas' was staged by the Board when 35 manufacturers took part. A measure of progress since then is that the present exhibition is supported by 88 manufacturers. Only by restricting the physical size of exhibits was this number accommodated. If space had permitted, many more would have participated.

As with the other exhibitions, 'Industrial and Commercial Heating' is being held at the Division's Headquarters, 195 Townmead Road, Fulham S.W.6.

Heating consultants, engineers and their clients will be able to inspect all forms of heating. Equipment displayed includes hot water boilers up to 5.4 million Btu/hr., suspended and floor-standing air heaters of all types, unit overhead radiant heaters, radiators and fires for offices and a few steam boilers. Water heaters for cloakrooms, etc., are included. New products introduced in the last two years are on display—make-up air heaters, a wall-mounted boiler with mechanical extraction, continuous overhead radiant heaters using large and small diameter low temperature tubes, and a combined heater/absorption refrigeration air cooler. A selection of the latest controls and ancillaries for heating systems is also on show.

*The opening of the Industrial and Commercial Heating Exhibition, by gas, at Fulham.*

This exhibition has been put together expressly to help these people and their professional advisers assess the merits of different systems of gas heating, by freely availing themselves of the facilities provided. Until further notice it will be open from 9.00 a.m. to 5.00 p.m. Monday to Fridays, and anyone wishing to visit the exhibition will be most welcome. Calls by appointment are recommended, and arrangements can be made in writing or by telephoning Mr. D. W. P. Freeman, Industrial Publicity Officer on RENown 1212.

## ELECTRICITY IN THE HOME

A big and fascinating exhibition of electric domestic appliances was staged in February at Brighton by the Electrical Development Advisory Division of the Electricity Council. The whole field of electricity usage in the home was covered, from refrigeration to electric kitchen knives, and from remarkable self-cleaning cookers to home laundry appliances in wide variety.

On the heating side, which is where our interest lay in visiting the exhibition, the main feature that impressed us was the development of the electric storage heater, not only in efficiency but in design. Many of them are now positively elegant pieces of furniture to have about the house. Potential users should appreciate the differences between the straight storage heater without controllable heat output, and the fan-assisted heater, which enables heat to be extracted as required. The warm air central heating system, known as Electricaire, was also prominently featured.

One organizational feature may be commended. Instead of turning the press visitors loose in the exhibition with only a hand-out to help them, a briefing session was held beforehand. Here a number of charming experts from the different area boards gave short talks on each of the main aspects of the exhibition, highlighting the most interesting features with the help of slides and sometimes the appliances themselves.

## ELECTRIC TRICYCLE

An electrically driven tricycle, which may have a big export potential, is being tested by three electricity boards. Developed by Tube Investments Ltd., it is called the Trilec. The two rear wheels are only inches apart and the machine is powered by conventional lead-acid batteries. It has a maximum speed of 20 m.p.h., and a range of up to 40 miles. A novel feature is a pivoting arrangement which enables the rider to lean sideways for balance as the scooter turns, while the wheels remain on the ground.

# Air Pollution Abstracts

**1039. To the Problem of Securing the Purity of the Atmosphere in the Neighbourhood of Industrial Plants.** Livčak, I. F. (in Czech) (Zdravotni Technika A Vzduchotechnika), 1967, **10**, No. 5. (235-239). The paper draws attention to the problem of contamination of the atmosphere in the area and in the neighbourhood of industrial plants, which deteriorates the aeration efficiency of the plants. The means for diminishing concentration of harmful substances in the outside atmosphere are discussed, they are analyzed and the necessity for atmospheric control by measurement is emphasized

**1040. The Measurement of Nitrogen Dioxide in the Air.** Shaw, J. T. (Atmospheric Environment, March 1967, **1**, No. 2. 81-85). The "Hersch" electrolytic nitrogen dioxide generator has been used to provide accurately known weights of nitrogen dioxide and hence to evaluate a calibration factor for the colorimetric reagent described by Saltzman (1954) for the determination of this gas. A method of testing whether the electrolytic generator was giving a quantitative output of $NO_2$ is described. The work has confirmed Saltzman's value of 0·72 for the calibration factor. An assertion that the calibration factor is dependent on the concentration of nitrogen dioxide sampled, is re-examined and dismissed, the observations being re-interpreted on a simple basis. A tentative suggestion is made as to why, in recent work by Stratmann and Buck, a calibration factor equal to unity has been found.

**1041. Eye Irritation as a Biological Indicator of Photochemical Reactions in the Atmosphere.** Wayne, L. G. (Atmospheric Environment, March 1967, **1**, No. 2 97-104). Studies involving the quantitation of eye irritation produced by experimental exposure of human to synthetic atmospheres are discussed. The principal methods used are panel measurements of intensity, threshold, or response delay. Advantage and difficulties of each method are reviewed, as well as characteristics of the data generated and appropriate means of manipulating the data. Evidence regarding the possible chemical identity of irritants in photochemical smog is discussed, leading to the conclusion that not all observed eye irritation is accounted for by additive effect of formaldehyde, acrolein, and peroxyacyl nitrates. Implications of the findings for air pollution control policies are considered.

As one of the undesirable manifestations of photochemical smog, eye irritation has been the subject of a number of studies in recent years. This article reviews several of these studies with particular reference to those aspects relevant to air pollution research and air pollution control policy.

**1042. Comparison of Methods for the Determination of Benzo (a) Pyrene in Particulates from Urban and other Atmospheres.** Sawicki, E. et al. (Atmospheric Environment, March 1967, **1**, No. 2. 131-145). A group of methods for the determination of BaP in air and in other complicated mixtures are compared. Many of the methods are introduced in this paper and all have been applied to the determination of BaP in airborne particulates. Some of the factors which have been compared are precision, accuracy, man-hours of work and total analysis time. Specific recommendations are given for methods by means of which a high order of selectivity, a maximum amount of information, a considerably reduced analysis time, or a low cost of analytical operation are possible. The use of the relatively low cost fluorimetric procedure is achieved with the loss of simultaneous characterization.

**1043. Some Developments in Dust Pollution Measurement.** Lucas, D. H. and Snowsill, W. L. (Atmospheric Environment, November 1967, **1**, No. 6. 619-636). The measurement of dust emission is considered in relation to public complaint. At least two measurements are required—ideally these should be dust amount and dust grading. No viable instruments exist to measure dust amount or dust grading continuously, and in practice it is best to use an instrument to record the optical density of the flue gas and a C.E.R.L. dust monitor. These monitor directly the two main causes of complaint. They also give warning of certain forms of inefficiency in combustion. In addition the comparison of their readings is a useful indication of dust coarseness.

**1044. Transistor Receiver 50-54 mHz.** Latsky, C. E. Radio ZS, March 1967, 19-24). A simple six-metre receiver is described which operates consistently with little adjustment. It has been used by the C.S.I.R. Air Pollution Research Group to monitor telemetry signals from a radiosonde carried aloft by a seven-foot kite balloon. Data transmitted was the air temperature, coded as M.C.W. in Morse letter symbols, representing two digits of the temperature. The operating frequency was 53·5 mHz in the licence-free telemetry band. The circuit performs smoothly and may be incorporated also in amateur equipment.

The data acquired is important in predicting the ability of the atmosphere to disperse smog.

**1045. Mortality and Morbidity during a Period of High Levels of Air Pollution, New York, Nov. 23 to 25, 1966.** Glasser, M. et al. (Archives of Environmental Health, Dec. 1967. **15,** No. 6. 684-694. With the onset of high levels of air pollution, daily deaths due to all causes immediately rose to higher than expected levels, and remained at higher than expected levels for seven consecutive days. There were 24 more deaths per day than during the control periods. Thus, in all there was a total of 168 excess deaths.

The excess number of deaths per day was observed in each of the three age groups considered. This excess increased with increasing age.

Significant increases in the number of deaths were observed on one or more days for arteriosclerotic heart disease, vascular lesions of the central nervous system, malignant neoplasms of the respiratory system, the category "other diseases of the circulatory system" and the miscellaneous group "all other causes". The timing and duration of the observed increases varied by cause of death.

Because the weather was unseasonably warm during the air pollution episode, daily death patterns of another warm spell characterized by normal levels of pollution were examined. It was concluded that the rise in temperature at the time of the episode could not account for the observed increase in mortality, although it might have been a contributing factor.

The number of emergency clinic visits for bronchitis and asthma at seven large New York hospitals was examined. There was a rise in the number of such visits on the third day of the episode, among patients age 45 and over, at three of the seven hospitals investigated.

Unfortunately, the Thanksgiving Day holiday greatly complicated this portion of the study. The data available do not make it possible to evaluate the contribution, if any, of the Thanksgiving Day holiday to the observed rise emergency in clinic visits.

**1046. Studies on a New Method of Simultaneously Removing Sulphur Dioxide and Oxides of Nitrogen from Combustion Gases.** Ryason, P. R. and Harkins, J. (J.Air Poll.Contr.Ass. Dec. 1967. **17.** No. 12. 796-799). Simultaneous reduction of $SO_2$ and NO by catalyzed reaction with carbon monoxide at space rates approaching $10^4$ vol/vol/hr has been shown. The reaction of sulphur dioxide with carbon monoxide results in the formation of carbon dioxide and elemental sulphur. Nitric oxide reacts with carbon monoxide to form carbon dioxide and molecular nitrogen. Metals supported on alumina appear to be the preferred catalysts. Among the effective metals are copper, silver and palladium. A side reaction of carbon monoxide with elemental sulphur to form carbonyl sulphide requires that the initial amount of carbon monoxide be stoichiometric for the amount of sulphur dioxide plus nitric oxide present. A furnace employing this method would have to be operated at low excess air, near stoichiometric fuel/air, or possibly slightly on the rich side.

**1047. Comparison of Three Methods for Trace Analysis of Polycyclics.** Dubois, L. et al. (Mikrochimica Acta (Vienna) 1967, **5,** 904-911) (Presented at the Anachem Conf., Detroit, Mich., Oct. 11, 1966). Several analytical techniques for the determination of polycyclic aromatic hydrocarbons in air have been evaluated. Two solvents, benzene, and cyclohexane were compared for their efficiency in the preliminary preparation of the air sample. To identify and measure the polycyclics, the techniques of ultraviolet absorption and fluorescence were used. Air sample extracts were analyzed with and without prior chromatographic separation. A rapid chromatographic procedure using benzene as elutant was employed for the first time. The extract aliquot or eluate fraction was chromatographed on fully activated alumina using benzene as the eluting solvent. BaP and BkF are eluted from such a column in 30 minutes or less in a total eluate volume of perhaps 50 ml. and the two hydrocarbons are determined by fluorescence emission. Work in progress suggests that benzene may be replaced in this application by the less toxic toluene. By any method used the BkF values found were in good agreement. The agreement between the various BaP values was poor, suggesting not all were of equal validity. The highest, and also least accurate, BaP values seem to be associated with the use of benzene as extractant, or ultraviolet absorption as a measuring technique.

**1048. Measurement and discussion of dust concentrations in working places, with special reference to various dust measuring instruments.** (In German). Winkel, A. (Staub, Jan. 1968, **28,** No. 1, 1-7). The author compares results obtained by different dust measuring instruments in dust testing chambers and industrial working places. Instruments for measuring particle number concentration (HS konimeter and thermal precipitator) and also those for gravimetric methods, using a "Mikrosorban" filter, were compared. The conditions were discussed under which the methods for particle counting are in satisfactory agreement. Further, a conversion factor for quartz dust was evaluated for konimeter values and for the "Mikrosorban" filter method. According to this factor a particle number concentration of 1 particle $<5\mu m/cm^3$ corresponds to a gravimetric concentration of $0{\cdot}0038 \pm 0{\cdot}0006$ mg/m³. In the case of organic dusts, as a result of low density, a lower conversion factor was obtained which exhibited essentially higher fluctuations.

**1049. A Study of Catalyst Support Systems for Fume Abatement of Hydrocarbon Solvents.** Miller, M. R. and Wilhoyte (E.I. du Pont de Nemours & Co. Inc., Wilmington, Del.). (Presented at the Air Poll.Contr.Ass. Meeting, Cleveland, June 15, 1967). With the lower temperatures required for high efficiency of combustion, catalytic oxidation offers an opportunity for large fuel cost savings to the user, compared with direct-flame incineration alone. The latter, however, can be of great value in preheating effluent gases to the moderate temperatures needed for catalytic action. Catalyst support geometry has an important influence on oxidation efficiency. This influence is not simply predictable from such superficial considerations as bed volume, catalyst surface area or pressure drop. Honeycomb structures, which are relatively new in catalyst support, technology, offer flexibility of choice in terms of unique high efficiency or moderate efficiency with low resistance to air flow.

**1050. A method for sampling and determination of organic carbonyl compounds in automobile exhaust.** Fracchia, M. F. et al. (Env. Science & Techn., Nov. 1967, **1,** No. 11, 915-922). New methodology for analyzing the more than 20 different carbonyl compounds in automobile exhaust gas helps to determine the concentration of any one carbonyl compound for different operating modes of the engine. An engine having no exhaust control device and at fast idle almost doubles its output of carbonyl compounds other than formaldehyde which is increased by 40 per cent. The methodology involves scrubbing the exhaust gases, converting carbonyl compounds to 2·4-DNPH derivatives, and gas chromatography of a carbon disulphide solution of the derivatives using a flame ionization detector.

**1051. Waste Incineration in Small Units.** Baum, F. (Staub, (In English), July 1967, **27,** No. 7, 23-25). Emission measurements ($CO$ and $CO_2$, hydrocarbons, solid matter content) were carried out in refuse incineration plant. Concentrations of $CO$ and $CO_2$ were low as compared with medium size plants. Dust measurements were affected by unburnt, noxious gases from low-temperature carbonization, because these gases were settling on filters. The results show that directives and regulations for testing these plants are necessary.

**1052. Sulphur Dioxide Analyzer.** (Union Industrial Equipment Corp., Chem. Eng., June 1967, **74,** 95-96). This new instrument measures $SO_2$ concentrations of 200 to 3,000 ppm. in stack gases. Total time required for both sampling and reading is 5 min. First, the probe is inserted through the port of the flue. A 100 ml. sample of the gases is drawn by the vacuum pump through a moisture control tube into a detector tube. After 3 min., the operator removes the detector tube from the sampling apparatus. $SO_2$ turns the reagent in the tube from white to an orange stain.

The concentration of $SO_2$ is read by comparing the length of the stain with a calibrated chart. No temperature correction is needed and $CO_2$, CO, $NO_2$, NO, $N_2$ and $O_2$ do not interfere.

**1053. A Status Report on Controlling the Oxides of Sulphur.** Hangebrauck, R. P. and Spaite, P. W. (J.Air Poll.Contr.Ass., Jan. 1968, **18,** No. 1, 5-8). Atmospheric pollution by sulphur oxides is discussed in terms of the sources of the pollutant and the possible methods of control. Possible approaches to control are classified in general categories, including fuel desulphurization, process modifications, and flue-gas desulphurization. Some of the more promising specific possibilities are discussed in relation to the organization developing them.

**1054. Air Pollution Problems at a Proposed Merseyside Chemical Fertilizer Plant: A Case Study.** Scorer, R. S. (Atmospheric Environment, Jan. 1968, **2,** No. 1, 35-48). This study was undertaken on behalf of Shellstar Ltd., in 1966, who planned to build a fertilizer plant on the south side of the Mersey estuary. The chief problem arose from its closeness to the town of Helsby, some of whose houses are on high ground within a mile of the site. There was also the risk of a haze of ammonium compounds of a kind already experienced on Tees-side.

From a study of records selected from suitably chosen meteorological office stations and a knowledge of the topography and the behaviour of fog and winds in the Merseyside area it was found that in very stable conditions the air drift was away from Helsby and that although the most common wind was from the site towards Helsby this was normally more unstable and fresher than average. The fogs on Merseyside are of quite a different nature from those on Tees-side and no chemical haze problem is expected.

The case illustrates the importance of making the correct correlations of meteorological elements because the *prima facie* implications of long-term averages of individual elements are quite misleading in this case. None of the important problems in this case was soluble by use of dispersion formulae.

During the study it became obvious that although there is often a serious reduction in visibility in the south Merseyside area from distant pollution, domestic pollution in Helsby is the worst problem there. Other major sources are the BICC works in Helsby, Ince Power Station, Stanlow Refinery, and road and rail traffic. The traffic was also a substantial source of noise. The new plant would not be a source as bad as any of these.

**1055. Behavioural Impairment Associated with Small Doses of Carbon Monoxide.** Beard, Rodney R. and Wertheim, George A. (Am.J.Pub.Health, 57, No. 11, Nov. 1967). Improvement is needed in the methods of setting standards of air quality. In establishing such standards, the effects of various pollutants upon human performance should be considered. Toward this end, the effects of exposure to carbon monoxide upon the ability of 18 young adults to discriminate short intervals of time were studied. Deterioration of performance was observed. This occurred after 90 minutes at 50 ppm., and at proportionately shorter times after exposure to higher concentrations up to 250 ppm. Experiments with rates, using operant behaviours schedules of reinforcement, showed rapid and marked disruption of the ability to judge time, with a significant decrement apparent after 11 minutes exposure to 100 ppm. during performance on a DRL schedule. It is suggested that methods derived from experimental psychology can contribute materially to the evaluation and understanding of both gross and subtle effects of CO as an air pollutant and can thereby aid in the formulation of standards of air quality.

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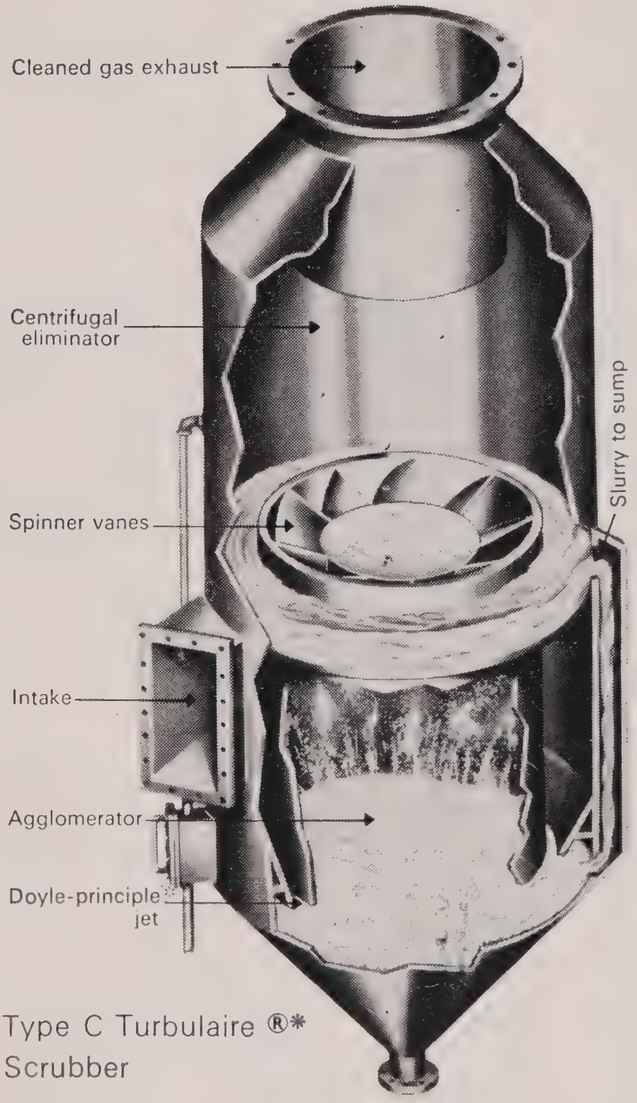
## British Technology Index

We would like to draw the attention of readers to the most useful monthly published under this title by the Library Association. It is a current subject-guide to articles in British technical journals, and covers some 400 such publications. It offers unique facilities for locating and reviewing new information in all sectors of technology, using an alphabetical arrangement that gives ease of consultation. Under the subject index "Air Pollution", for instance, there are references to a variety of articles, with cross-references to grit and dust. *Smokeless Air* is included among the journals listed.

The index is available from the Library Association at 7 Ridgmount St., Store St., London W.C.1. at a subscription rate of 18 guineas a year ($60 U.S.A.).

# New Gas Scrubber With 10 Advantages

The Type C Turbulaire®* Scrubber



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2. Trouble-free—no moving parts to wear out, no spray nozzles to clog.
3. Positive hopper agitation keeps slurry in suspension at up to 50% concentration.
4. Wide open design eliminates plugging—cleans gases containing over 20 grs/cf of dust without need for pre-cleaners.
5. Pressure drop and efficiency custom engineered to meet each individual application.
6. Simple field modification adapts unit to maintain constant efficiency at varying volumes.
7. Can be furnished in a variety of materials for corrosion resistance, etc.
8. Three space-saving configurations; same principle, same efficiency.
9. Low wet-zone velocities eliminate attack by abrasive slurries.
10. Delivers cleaned, cooled gas to stack or process.

* U.S. Patents 2,621,754 and 2,720,280

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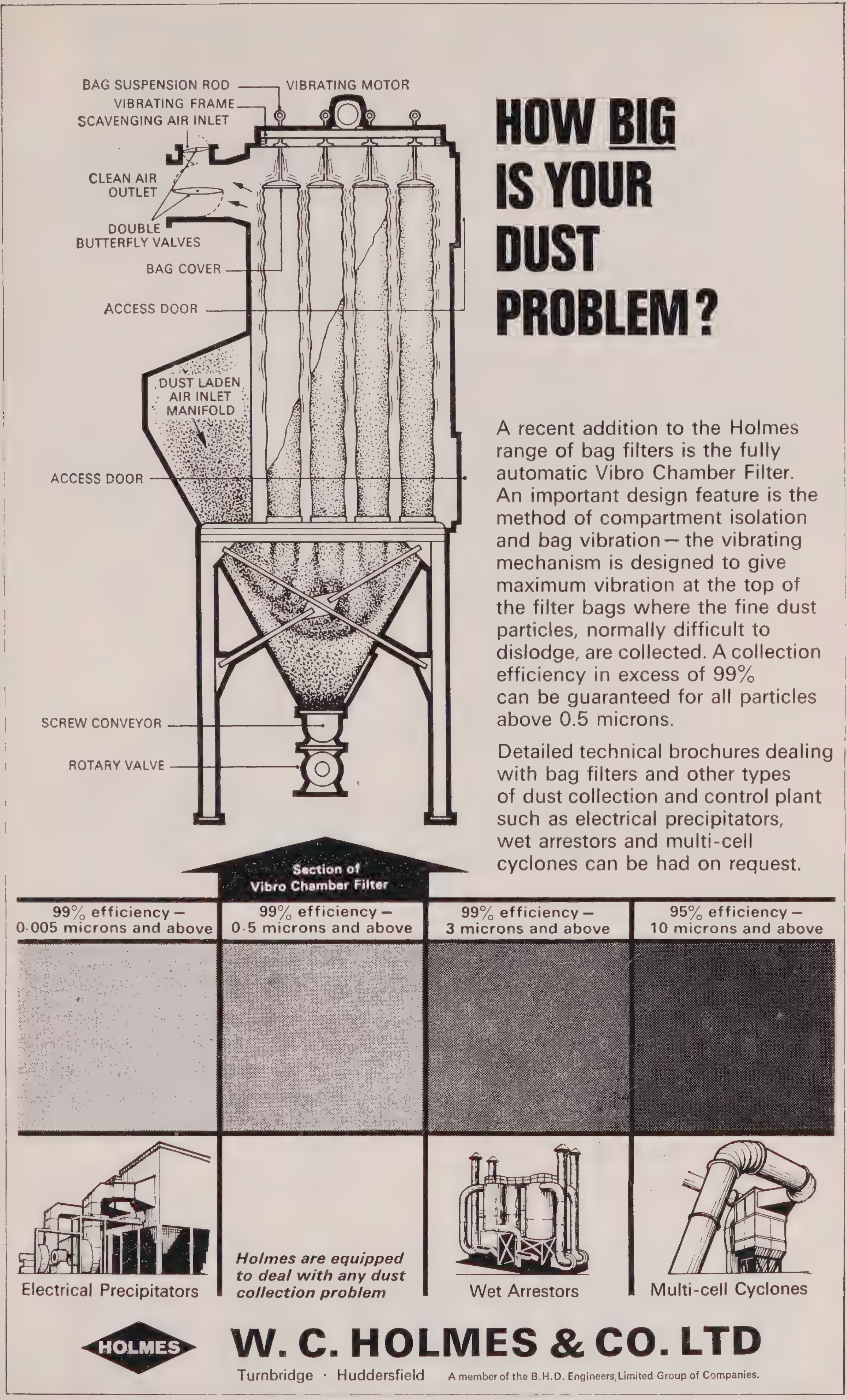

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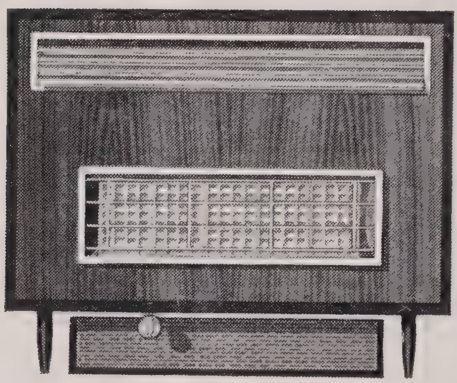

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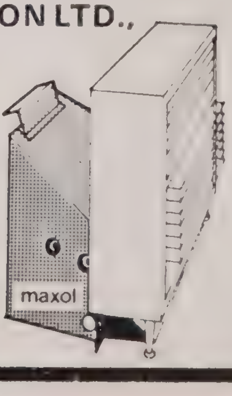

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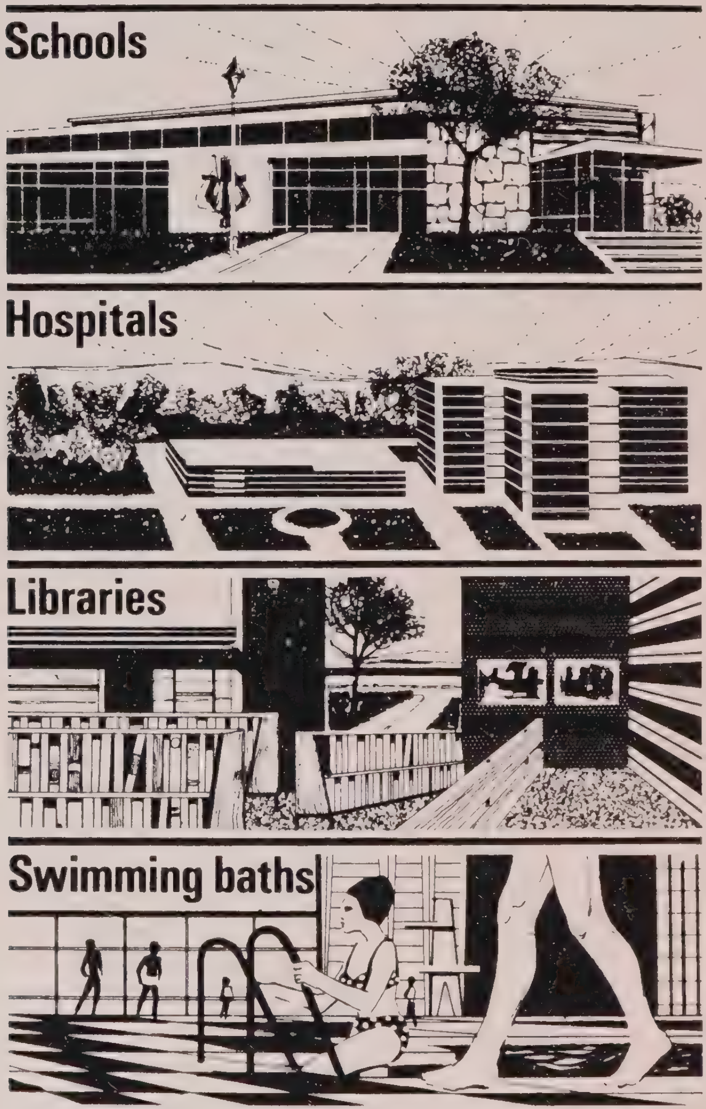

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# SMOKELESS AIR

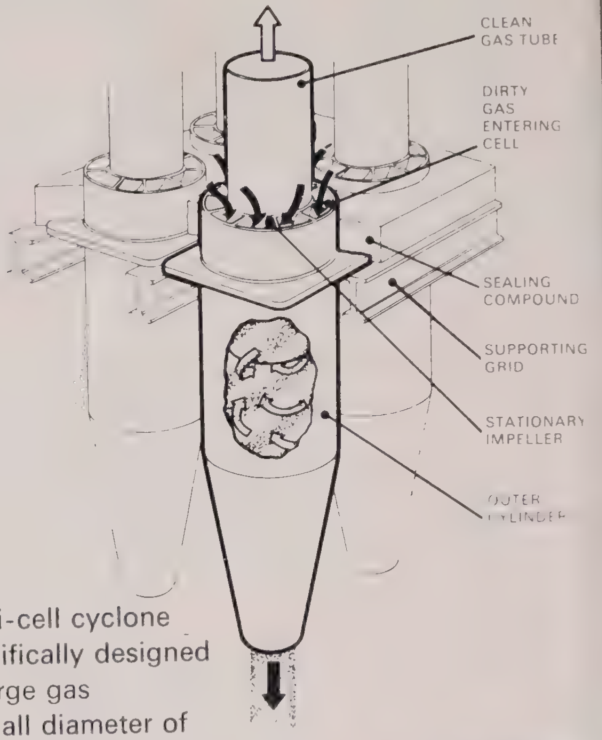
JOURNAL OF THE
NATIONAL SOCIETY FOR CLEAN AIR

No. 146 ★ SUMMER 1968 ★ 3s.

*In this Issue*

Lord Kennet on "Clean Air—Where Now?" ★ Retrospect and Prospect
The Problems of Smoke Control ★ Grit and Dust
Nuclear Power ★ Programme for Harrogate

# HOW BIG IS YOUR DUST PROBLEM?



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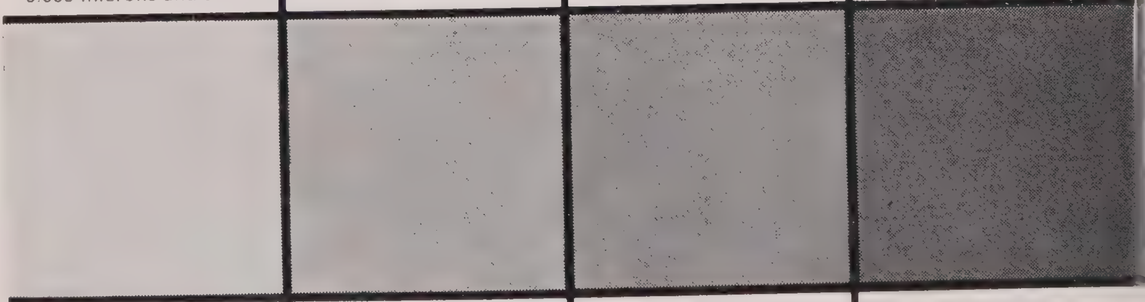
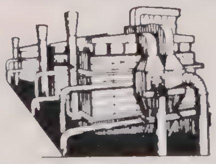
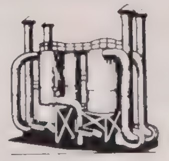


Electrical Precipitators



Bag Filters



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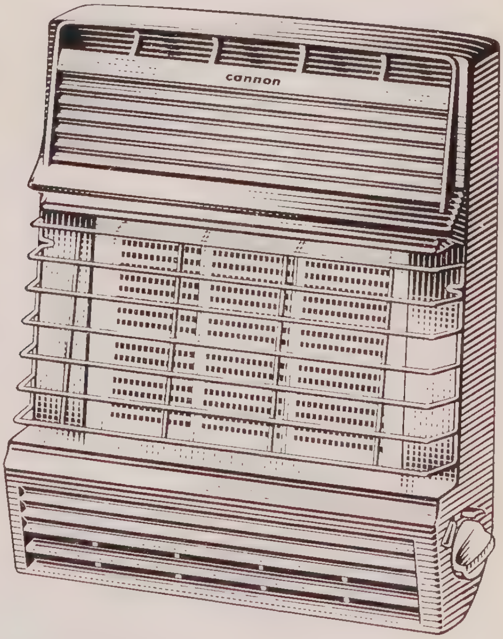

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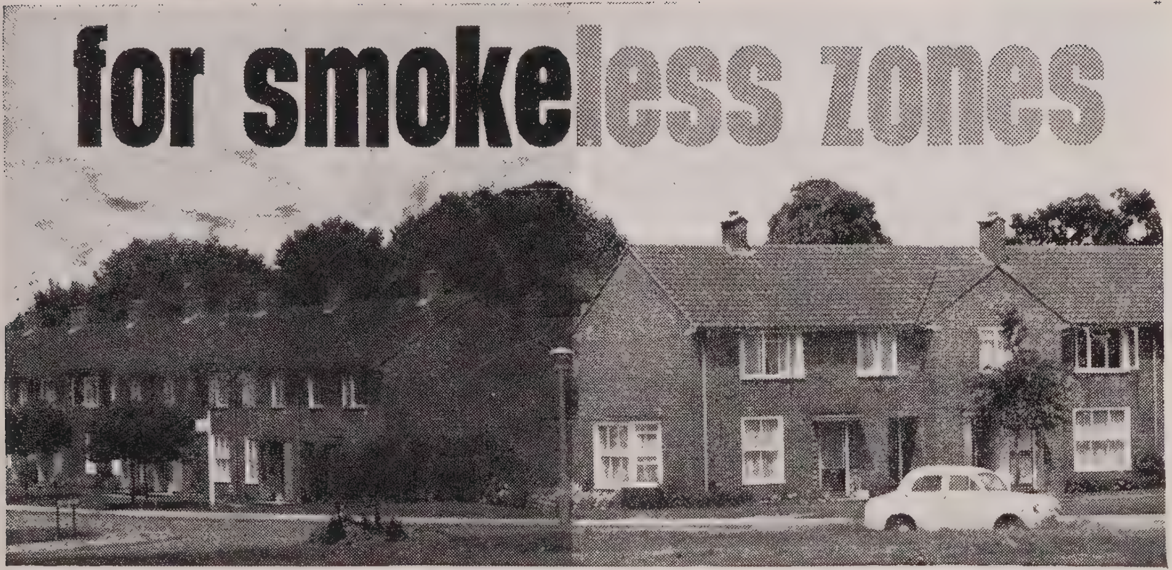

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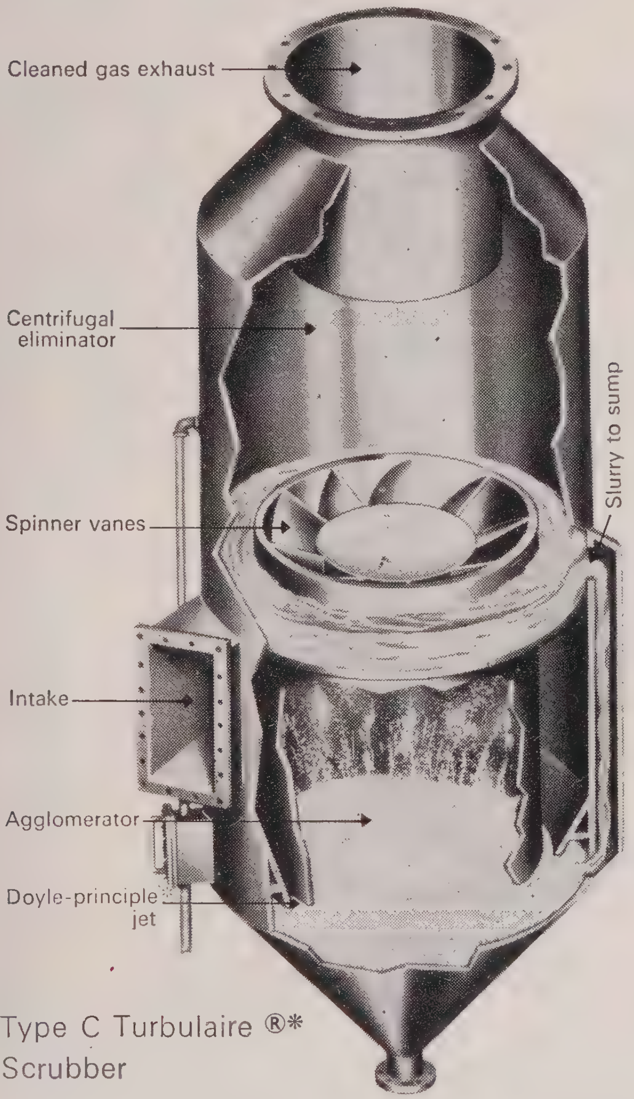

Type C Turbulaire ®* Scrubber

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**2** Trouble-free—no moving parts to wear out, no spray nozzles to clog.

**3** Positive hopper agitation keeps slurry in suspension at up to 50% concentration.

**4** Wide open design eliminates plugging—cleans gases containing over 20 grs/cf of dust without need for pre-cleaners.

**5** Pressure drop and efficiency custom engineered to meet each individual application.

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**7** Can be furnished in a variety of materials for corrosion resistance, etc.

**8** Three space-saving configurations; same principle, same efficiency.

**9** Low wet-zone velocities eliminate attack by abrasive slurries.

**10** Delivers cleaned, cooled gas to stack or process.

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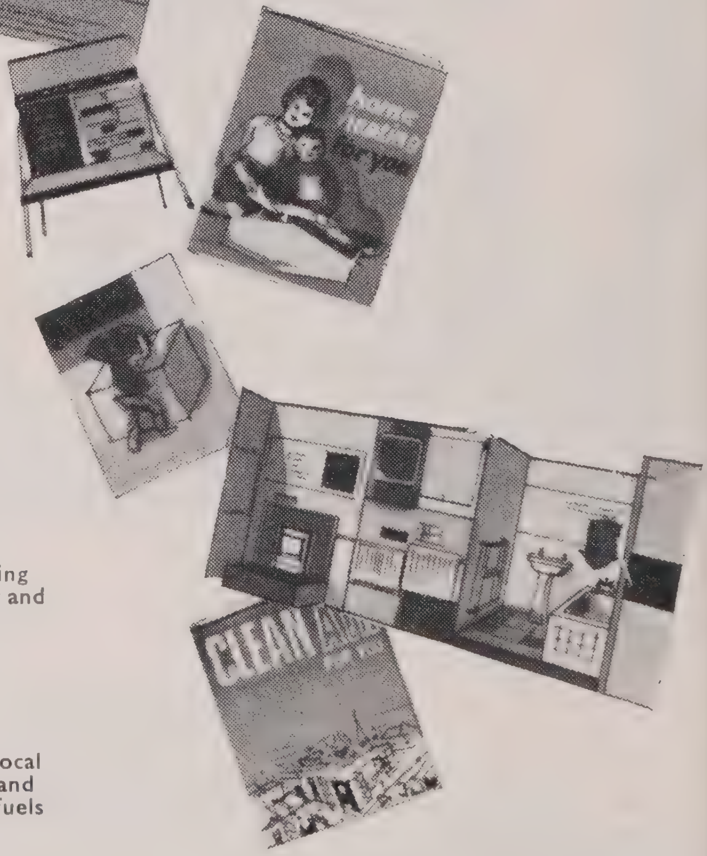

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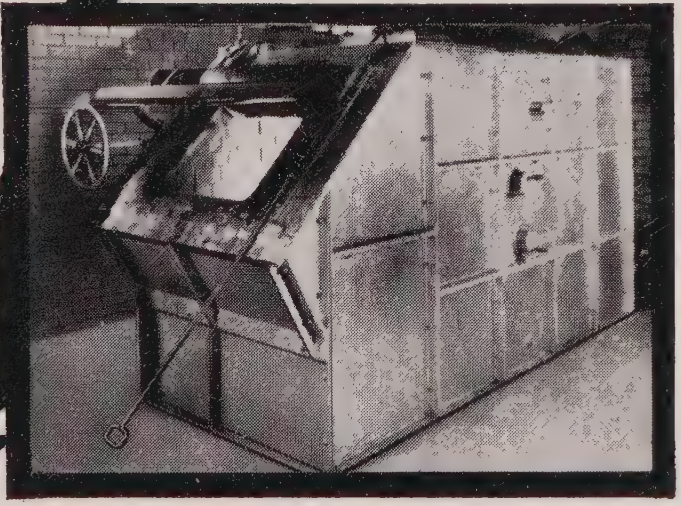

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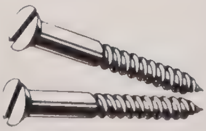

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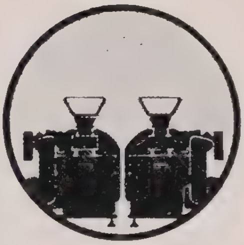

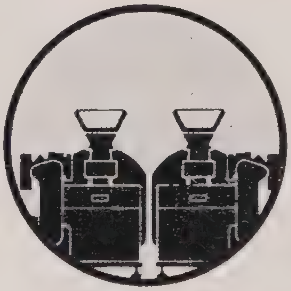

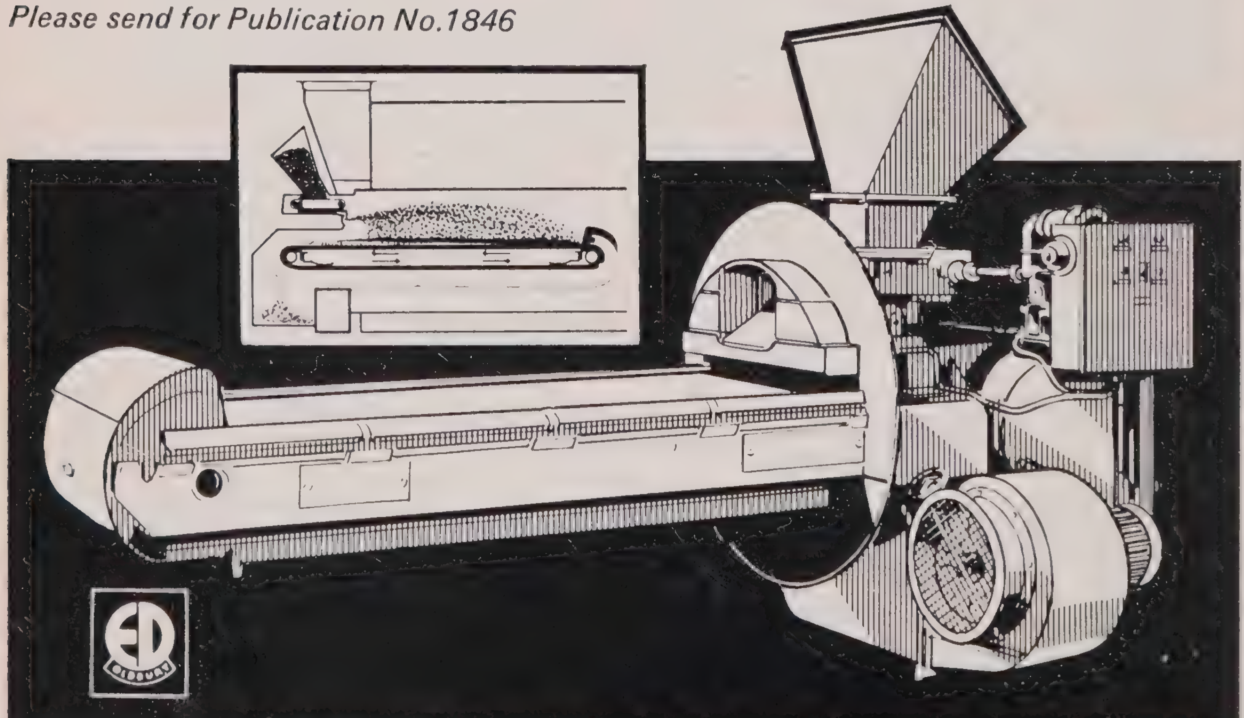

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# SMOKELESS AIR

Vol. XXXVIII No. 146 Summer 1968

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: 01-242 5038 (Editorial and Advertising). Editor: Arnold Marsh; Asst. Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SMOKELESS AIR only, 12s. per annum, post free.

SMOKELESS AIR is the official organ of the Society, but the views expressed in contributed articles are not necessarily endorsed by the Society. Abstraction and quotation of matter are permitted, except where stated, provided that due acknowledgements, including the name and address of the Society, are made.

Technical articles of full page length, or over, in SMOKELESS AIR are indexed in British Technology Index.

ABC
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**Net Certified Circulation 5864**

*Ships, towers, domes, theatres and temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air.*

# SMOKELESS AIR

## *Money Matters*

IT is with a "this is where we came in" feeling that your retiring editor considers that he should begin his final editorial notes on a question that is as old as the Society itself—the state of its finances. From its beginnings there have been recurrent times of anxiety over funds, with tightenings of the belt and renewed efforts and appeals being made to make possible the next step forward. The Society has always demonstrated its vigour and purpose by trying to do more than it can comfortably manage on its invariably slender resources, but the progress curve has always been upwards, even if sometimes it has been a little wobbly.

This is not to suggest that anything like a financial crisis is here or imminent. The situation, touched on in the last annual report, is an obvious one. The present national economic situation makes it difficult to obtain new members and generous contributions; costs are ceaselessly creeping up; the economy drive in local government and other quarters is reducing the revenue from the annual conference and exhibition; there was a deficit on last year's working, and the modest reserves the Society possesses had to be drawn upon. On the other hand it is gratifying that the support of existing members has been well maintained, and the only losses have been from a few corporate bodies who have themselves been forced to cut expenditure.

The persistent increase in costs is of main concern, especially for an organization that depends so largely on the printed word and postal services. Another problem coming closer is that the lease on the headquarters offices ends in 1970, and that in itself will inevitably involve serious budgeting problems.

Active steps are now being taken to seek increased support, firstly by a special appeal to our bigger members for short-term but substantial lifts in their contributions to help tide over immediate difficulties; secondly—despite the time not being the most propitious—by a general drive for new members and donations; and thirdly by a relatively small, all-round increase in the minimum rates of membership subscriptions.

Amendments to the byelaws to raise subscription rates will be moved on behalf of the Executive Council at a Special General Meeting to be held during the annual conference at Harrogate in October, formal notice of which will be sent to all members and representatives in due course. It is hoped that the changes to be proposed will be seen to be unavoidable and that they will be accepted with understanding.

## *The New Bill*

Although the Clean Air Bill introduced by Robert Maxwell, M.P., was given a second reading and sent to Committee as early as 16 February, it is only just as we go to press that further progress was made. Because congestion is severe in the Standing Committees that consider Bills in detail, it was proposed that this one, being non-contentious except in some details, could be dealt with more expeditiously by a committee of the whole House. On several occasions this was blocked by anonymous cries of "Object!" but finally, on 11 April, with Government support, it was agreed to on a division. The opposition appears to have been on a point of procedural principle, and not to the Bill itself.

The Committee stage was then put down to be taken on 3 May, but this was never reached because of the time taken by discussion on the Sunday Entertainments Bill. However success came on 10 May, when the Bill was taken, amended, agreed, and given its third reading. It will now require to go to the Lords, return to the Commons, and finally await the Royal Assent before it can be called the Clean Air Act, 1968.

We regret that the Committee stage should not have been reached before this issue of *Smokeless Air* had to be prepared and sent on its way to the printer, so that a review and summary of the Bill as it now stands cannot be included. This note is in fact a hurried substitution of the one that had been written before 10 May. However, it is hoped that the Bill will have become the Act in good time for full treatment to be given in our Autumn number. All we can add at the moment is that it is gratifying that the Bill has safely surmounted its worst hurdles, and that all should now be well.

## *More Praise for Clean Air*

Benefits attributed to the Clean Air Act continue to be voiced, and very encouraging it is to note them. In our last issue we gave an account of a report on the increased nesting of the house martin in London, said to be because there is now more insect food available in the cleaner atmosphere. This has now been followed by a report on the royal parks which records that a number of species of birds have now returned to their London sanctuaries, including among them the hoopoe, the great northern diver, the osprey, and the snow bunting. Again the Clean Air Act is given the credit.

The flora of London is also benefiting, according to a writer in the journal of the Royal Horticultural Society. Describing her South Kensington she says: "Lamb's Ears (*Stachys lanata*) is a 'must' to me as an edger, and there is little doubt that it is thanks to the Clean Air Act that this woolly-leaved plant now lives on, as in the country, whereas formerly it had to be replaced annually." Further north, there is an interesting report from Halifax, where, it is said, many plants and flowers will now flourish because of the improvement in the atmosphere. A local nurseryman complains that gardeners have not realized what can now be grown, and still persist in keeping to the old pollution-resistant standbys.

Then we are able to publish, on another page, an article arising from the recent cleaning of the Nelson column in Trafalgar Square, the illustrations to which tell their own story. "A new significance was given to the business of cleaning and restoring buildings," the writer begins, "by the passing of the Clean Air Act. . . ." As he points out, it is the knowledge that buildings will now stay clean that prompts a willingness to undertake the operation. Behind the Nelson column the front of the National Gallery is also being cleaned, and, approached from Whitehall, the Square has taken on a remarkably fresh and lovely appearance.

And then, entering a very different field, we can quote from a recent *Evening Standard* article in which a Carnaby Street outfitter declares his belief that there is a great future for the light coloured suit for men. "It's the Clean Air Act", he is reported as saying, "that has really cleaned up the air in London. Only three or four years ago the air was so dirty that you had to change your collar twice a day. But now you can wear a cream-coloured suit without worrying about it getting dirty almost at once."

Finally, we were pleased to hear a

tribute recently from a visitor from Prague to the Society's office. Prague, it seems, has quite a severe air pollution problem (due largely to the burning of brown coal in domestic stoves), and he said how agreeably surprised he was at his first visit to London. It was so bright and clean, he said, "like being in a park".

All these pointers, small in themselves, add up to something significant: the great changes that are being brought about by cleaner air. There may still be a long way to go (especially in the midlands and north), but there can now be no doubt about the reality of the great benefits that the clean air movement is bringing to Britain. (All of which, if the retiring editor may intrude once more, is a most gratifying observation to be able to make in his final column!)

## *Grit and Dust*

On another page we report the new Regulations on the measurement of grit and dust under the provisions of section 7 of the Clean Air Act 1956. This is an important step forward in the control of what is becoming, as a result of the falling emissions of smoke, the most important particulate pollution from industry. Some time is likely to be required for the regulations to become fully effective, and note will have been taken by the local authorities of the cautionary pointer by the Ministry that they should be used only when really necessary.

The application of the regulations will be a technical exercise calling for knowledge and skill, and we are pleased to report that the South East Division of the Society is at the moment discussing the possibility of holding an instructional course on the subject, perhaps through one of the London technical colleges. As the Hon. Secretary of the Division, J. S. Hodgins, has put it: "These Regulations, together with the proposed amendments of the Clean Air Act on the same subject, indicate that the technical officers of local authorities are likely to become much more deeply involved in these problems than hitherto. A more detailed knowledge of the technique of sampling, and the interpretation of results, than is at present generally available, will be needed".

We hope that the proposal will commend itself to the other Divisions of the Society.

## *A New Emblem*

There was a note in the last issue about the need for a new emblem for the Society. This has been further discussed by the Publicity Committee, and the Executive Council has agreed to their proposal that there should be a competition for an emblem design. Although the competition will be open entries will be sought particularly from students and staff in schools and colleges of art and design. Only one design is needed, and therefore there will be only one prize: £100. Details are now being worked out and any readers, or friends of readers, who may be interested should write in and ask for full information to be sent to them as soon as it is published.

## *The A.G.M.*

The Society's annual general meeting on 26 April, which preceded the address reported on another page by Lord Kennet, passed off with its customary celerity. The annual report and accounts were accepted and will be reprinted in the new edition of the Clean Air Year Book, about to be published. The election results for divisional representatives to the Council showed few changes, and tribute should be recorded to those valued members of long standing who have recently retired from that body. They are John Innes of Paisley, a former chairman of the Council, Alan Hacking, representative of the British Iron and Steel Federation, and E. J. Winfield of Castleford. We would like to express appreciation to them for all they have done for the Society and the cause of clean air. We wish them well in their retirement.

# CLEAN AIR — WHERE NOW?

*Address following the Society's A.G.M. in London on 26 April 1968*

*by*

**Lord Kennet**

*Joint Parliamentary Secretary, Ministry of Housing & Local Government*

THE conclusion of the Annual General Meeting of the National Society for Clean Air has become the occasion for a sort of annual review by one of Her Majesty's Ministers of the progress being made in the field of clean air, and the opportunity for a statement of policy to be made. It is fitting that this should be so, because to some extent the NSCA represents the conscience of the nation. If the door against which it has pushed for so long is now an open one, this is due to the efforts of the Society itself, under different names, over many years, to convince us all that air pollution is an evil, and an unnecessary evil at that.

By accepting as the title of this address "Clean Air—Where Now?", I have by implication undertaken to think aloud about likely future developments in this field. But first, "Where are we now?". What progress has in fact been made in the twelve years since the passing of the Clean Air Act 1956—or, for that matter, in the 105 years since the passing of the first Alkali Act? Well, certainly clean air, except perhaps in a few places where for honestly-held reasons it is associated with the passing of a way of life, is no longer a dirty word. Nearly everyone is in favour of it in general, however they may view in particular some of the methods employed to attain it. Clean air is accepted by most people, like pure water, as one of the simple, bare necessities of life, and they protest when they do not get it. We find it difficult to imagine what it must have been like to travel in the London Underground when the trains were drawn by steam locomotives. Our children may find it equally difficult to imagine what a "smog" was like. In fact, an analysis published in 1964 of the incidence of dense fog in Central London showed that its occurrence was less frequent in the period 1955-1962 than in the period 1947-1954. About the same time a study of the visibility statistics for London Airport (Heathrow) indicated that incidence of poor visibility had decreased regularly during the period 1949-63. And this trend has continued in succeeding years, the occurrences of visibilities of less than 2 km have diminished, and those of more than 20 km have increased. This has been most marked in the winter. The same has happened at Manchester Airport. The actual intensity of direct solar radiation as measured in Central London has shown a rising trend during the period 1957-63, and this trend appears to be continuing.

### Reasons For Improvement

The improvement in the atmosphere of this country is due partly to changes in social habit and taste which would perhaps have happened anyway without a Clean Air Act. The passing of the domestic servant has influenced the upper and middle classes to abandon coal fires and coal-fired boilers, and turn to cleaner and more convenient methods of heating. Central heating was on its way in long before the emission of smoke from a chimney was added to the offences in the criminal statute book. All this is true, but I am sure, nevertheless, that there has been a greater leap forward in the last twelve years than in the preceding fifty, and that this is due largely to the enactment and enforcement of the clean air laws. The indications are that in the field of smoke control the advance has been faster on the industrial than the domestic side. The amount of smoke produced by industry is estimated to have been reduced by over 75 per cent since 1958, as compared with a reduction of 30 per cent in domestic smoke over the same period. Industry has many emission problems other than smoke and great advances have been made in the technology of arrestment, more and more "practicable means" having become available to industry. Contrary to what I think is the general belief, the concentration of sulphur dioxide in the air has not increased overall, despite the industrial development which has taken place during that time. It is the reduction of other things which makes us notice it.

### Summary of Future Policy

Future policy for clean air must aim at further reducing domestic smoke, grit and dust emissions from industrial furnaces, gaseous pollutants, and (last but not least) motor vehicle exhausts. (I won't talk about the last topic today, because only last October Stephen Swingler dealt with it at your Blackpool Conference.) As our appetite for clean air grows, and technological advance gives us the means of controlling them, we shall also I think come to expect a progressive reduction of those emissions which are "offensive" without being positively harmful or dangerous to health—in a word, "nuisances" which are still amenable in the last resort only to the somewhat old-fashioned law of nuisance. The Clean Air Bill embodies useful short-term improvements. This is the first opportunity there has been (except for a small interpolation in the Housing Act 1964) to take a legislative step forward from the Clean Air Act of 1956 and at the same time to make some improvements in that Act. There has been some criticism of this Bill as inadequate and insufficiently radical —not, I hasten to add, from this Society—and it may be of interest to some if I fill in the background a little before commenting on the Bill's contents. Although it is a Private Member's Bill, my Department warmly support it. Much depends, in such a case, on the place in the Ballot for Private Members' Bills which the Member sponsoring the Bill holds. If he is too low down he will have little chance of getting the Bill through all its stages. We are fortunate in having Mr. Robert Maxwell to take over the baton from Mr. Robert Edwards, but his place in the ballot was a marginal one—thirteenth—and the Bill was and is, therefore, somewhat vulnerable to attack and sinking by a few well-directed shots from objectors to this or that provision. It cannot therefore be a very radical or controversial measure, but I am sure that within its limitations it is both useful and workmanlike. It is not, of course, in any way a party measure, and the backers include members from all three main parties. As you will no doubt have heard, Committee stage is to be taken on the floor of the House of Commons next Friday.*

### Extension of Control over Particulate Emissions

One of the principal objects of the Bill is to extend the scope of the existing control by local authorities over emissions of particulate matter from furnaces. If the Bill becomes law, a wider range of furnaces will come under the control of the grit and dust provisions of the Clean Air Act and there will be power to require the arrestment of particulate fumes, primarily metallurgical fumes from iron foundries. A most important new provision in this field is that giving the Minister power to prescribe standards of permissible emissions of grit and dust from furnaces. All classes of furnace, other than small domestic boilers, whatever the fuel they burn,

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*This was delayed. See Editorial comment.

*Lord Kennet speaking at the London meeting. Sir John Charrington in the chair, and at the right are A. C. Saword, Executive Chairman, and Dr. W. C. Turner, a Deputy Chairman.*

will become liable to have standards prescribed for them, and if they exceed the permitted limits their operators will have to prove positively that they used the "best practicable means" to limit the emissions. As you probably know, regulations under Section 7 of the Clean Air Act were recently made which will enable local authorities to require grit and dust emissions from larger furnaces—those burning pulverized fuel or solid fuel at a rate of one ton an hour or more—to be measured. We shall be watching with interest to see what use is made by local authorities of these powers, which the Bill extends, with some reservations, to the wider range of furnaces.

### Reform Of Chimney Height Control

For gaseous emissions, especially sulphur dioxide, the Bill proposes a more comprehensive system of controlling the heights of chimneys. Local authorities will be able to ensure, by and large, that new chimneys (or chimneys being put to new uses) will be high enough to disperse the flue gases effectively. They will, of course, continue to be guided by the rules for calculating height set out in my Department's memorandum on chimney heights. Also, residences, shops and offices will become subject to chimney height control for the first time.

### Mandatory Smoke Control

On the domestic smoke control side, perhaps the most interesting provision is Clause 6, which would enable the Minister to go to a "laggard" authority, and require them to submit, and in due course carry out, a programme for smoke control in their area. As you know, the principle adopted in the Clean Air Act was that the introduction of smoke control was a matter for local option, and there is no obligation on a local authority to use the powers given to them by the Act. The Beaver Committee recommended that first priority for supplies of smokeless fuel and public funds for adaptations to smokeless methods of heating and cooking should be given to those urban and industrial areas where the incidence of fog was highest. These areas were in due course called "black", and became the target for persuasion and propaganda aimed at getting them to make smoke control orders; but there was no legal power to compel them to do so. Performance has varied greatly between these authorities, in fact from 100 per cent to nil. There have been many complaints, especially by progressive authorities whose neighbours' smoke drifts over them and frustrates their efforts to give their town a cleaner face. So we have thought it right to accept for the Minister this power to make local authorities do what many people probably think is their duty. There has been no adverse press comment on this, and this is perhaps confirmation of what I said earlier, namely that it is generally accepted that local authorities, as well as central government, have a duty to the people of their towns and cities to make the air as clean as they reasonably can.

Last year I spoke to you about the difficulties of deciding to what extent it should be an offence to sell bituminous coal for consumption in a smoke controlled area. I hope you will agree that Mr. Maxwell and I have got it about right with the proposal that it does not matter who a coal merchant sells the stuff to: what matters is whether the door he delivers it to is in a smoke controlled area. So coal merchants will continue to be free to maintain offices and distribution premises in smoke-controlled areas so long as neither they nor anyone else on their behalf delivers bituminous coal to households in those areas. Of course, it is already an offence to emit smoke in those areas in any case, and under the Bill the person who buys coal to use in a smoke control area will also be committing an offence.

What are the significant developments now before us in the field of clean air? Let me deal first with fuel. The successful implementation of a policy of smoke control depends on the suitability and availability of smokeless fuels. It is not an exaggeration to say that there has been a fuel revolution in the last decade. Within the space of ten years gas production has moved from coal carbonization to an industry based on petroleum fractions, only to be followed by the discovery of natural gas on our own doorstep. The electricity generating industry has made tremendous advances in technology based on the fossil fuels, coal and oil, and is now faced with a future based on nuclear reactors. To some extent the inexorable advance of fuel technology will of itself result in cleaner air. The scale of the contribution made by the development of natural gas and nuclear energy can be judged from the estimates of total energy use in the recent White Paper on Fuel Policy, which shows that in 1970 out of a total inland demand for energy of 310m tons of coal equivalent, natural gas is expected to account for 25 m tons, and nuclear and hydro-electricity 16m tons. It is estimated that by 1975 natural gas and nuclear and hydro-electricity will account for almost a quarter of the total energy budget. This is not to say that solid fuel people will not have an important part to play in the reduction of domestic smoke for a long time to come. It is true that if we view the domestic heating problem solely from the point of view of air pollution, electricity and gas must be the most favoured fuels, with low-sulphur oil next in order of merit. But we cannot consider the air pollution aspect of the matter in isolation. Social and economic factors also play a large part, and we must allow in our future clean air policy for the continued use, on a considerable scale, of coal-based smokeless fuels suitable for burning on improved open grates—that is, open fires with controlled but not induced draught. All the indications are that there will be an adequate supply of such fuels. It may even become possible to use coal itself, if trials now being carried out by the National Coal Board prove successful. The Board have been working for some years on producing domestic heating appliances which will burn coal smokelessly, and some 30 to 40 of these are now being tested in private houses. If in due course such appliances can pass the test of smokelessness, and can be produced at a price comparable to the present range of approved solid fuel appliances, the possibilities seem promising.

Coal based fuels have one natural disadvantage, which they share with the other principal fossil fuel, oil—namely, they contain sulphur, and when burnt emit sulphur oxides. Sulphur dioxide, 6½ million tons of which are emitted from all sources in this country every year, is usually regarded as the most significant of the gaseous pollutants, although it is not the only one. A great deal has been said and written about the effects of sulphur dioxide and sulphuric acid on human and animal health, on vegetation and on metal, stone and brickwork. The corrosive effect of these substances is well established, and it is clearly desirable for them to be reduced. In the present state of technical knowledge the best practicable means for rendering emissions from power stations and from industry generally harmless and inoffensive is by dispersion from tall chimneys. This policy has been successful and will be continued, but we recognize that it is only a palliative until practicable means of prevention can be devised. One line of approach is to remove sulphur from the fuel before burning. This cannot be done for coal, but it can for oil. The Japanese, for instance, are installing plants for desulphurizing heavy oil by a process which it is claimed enables up to 90 per cent of the sulphur content to be removed. One such plant has begun operation in Kuwait. If desulphurization of oil used in this country could reduce the average sulphur content of 3 per cent to below 1 per cent, annual sulphur emissions would be reduced by at least a million tons. The capital investment required would be very considerable, and the annual cost is estimated to be in the region of £45m, taking into account the value of the ½ million tons or so of sulphur recovered. Clearly the question is primarily an economic one, and more study of the costs involved on both sides is needed. Many attempts have also been made to develop practicable means for removing sulphur oxides from flue gases, and results so far suggest that if an effective system can be developed, it could for economic reasons be applied only to the very large consumers of fuel such as new power stations. As soon as a practicabe method of preventing emissions is developed, the Alkali Inspectorate will no doubt require its use. It is possible, of course, that by the time a solution is found, the problem may have somewhat diminished in scale because of the development of nuclear power stations.

Finally, what does the next ten years or so hold for domestic smoke control? We must not forget that 80 per cent of the smoke emitted to air in this country still comes from domestic chimneys, and that less than half of the houses in the "black areas" (perhaps a quarter of the dwellings in England and Wales) have been covered by smoke control orders. The system of smoke control orders, with grants to householders to assist them in adapting to smokeless fuels has shown itself to be both acceptable, and fair; a momentum has been built up, which despite the present temporary check, will I trust enable all the present "black areas" to be covered by such control orders by about 1980. I also hope to see an extension of district heating schemes instead of lots of fires smoking at low levels: one central source of heat, whose emissions can be dispersed under proper control.

Although, as I said, four-fifths of our smoke comes from domestic grates, it is an important psychological and political fact that the four-fifths is generated by small people in very small packets, and the remaining one-fifth is generated by big people in big packets. I mean industry. Time and again local authorities have come to me and have said "We know perfectly well that most of the smoke in our town still comes from householders, but there are half a dozen thumping great chimneys belching it out at rather low levels" and it is simply not on, politically, to ask those householders to convert unless something can be done about that industrial contribution. So I think we must admit that, for human reasons, progress must continue on both fronts—both the domestic and the industrial. It is a very difficult question indeed, especially in times of capital scarcity, how far Government should force industry to go, thereby putting up its prices, in order to reduce environmental pollution. To answer this question with justice we ought to have certain facts, which we do not now have, and which, truth to tell, it is not clear to me whether we shall ever be able to have. How much does air pollution really cost the country? Can a technique be found of measuring the concentration of given substances in a given place, of measuring the effects of those substances on the materials of which that place is mainly made, and of deducing therefrom the true cost to society of the presence of those materials in those concentrations in that place? And, when this has been done, can we ever hope to arrive at an analytical technique which would offset the cost to society at large of the presence of those materials against the cost to a certain factory or factories in particular, and thus to their consumers, of taking the steps which will reduce that presence? All these are matters which I hope to discuss during the coming year in the Clean Air Council.

I believe I shall have the opportunity of proposing a toast to the National Society for Clean Air after lunch, but I should not like to let this more public occasion go by without recording my personal admiration of the great work done by your outgoing director, Mr. Arnold Marsh, over the years. I hope that he will derive satisfaction in his retirement from the knowledge that if the air of this country is now more suitable for the cultivation of exotic plants, that is in large measure due to his own great life's work, and that he will be able to spare time from this to continue to give us the benefit of his advice on the Clean Air Council.

And after lunching, I hope to welcome your new director, Admiral Sharp, to the field of clean air work as one former naval man should welcome another.

# GRIT AND DUST

*Measurement Regulations in Operation*

The Ministry of Housing and Local Government has now issued the Clean Air (Measurement of Grit and Dust) Regulations, 1968. (Statutory Instrument 1968, No. 431. H.M.S.O., 6d. net). The Regulations came into operation on 1 May.

A circular has been issued by the Ministry to local Authorities in England (11/68) and by the Welsh Office to authorities in Wales (14/68). As the circular points out, the regulations follow the "Grit and Dust" publication earlier sent to local authorities. The regulations enable local authorities to require the making and recording of measurements of grit and dust emitted from a furnace or oven covered by section 7(1) of the Clean Air Act 1956, the provision of the necessary apparatus and the supply to the local authority of the results of the measurements.

The circular suggests that when local authorities examine plans for furnaces or chimneys for the purposes of sections 6(1) and 10(1) of the Act, they should consider whether they are likely to make a direction under section 7 in respect of the furnace or oven concerned and whether they should advise the firm to incorporate appropriate sampling points in the course of construction.

The regulations require occupiers of buildings to make necessary adaptations to chimneys and to provide the apparatus required for measurement as described in B.S. 3405, 1961. On 28 days notice the occupier is required to make and record measurements of grit and dust, giving the local authority 48 hours notice of the date and time when he proposes to begin. A copy of the measurements must be sent to the local authority within 7 days, "in terms of pounds per hour of grit and dust emitted, and in the case of solid fuel fired boilers the percentage of grit contained in the solids emitted".

The circular ends by pointing out that the measurement of grit and dust emissions is time consuming and costly, and that "it should be required only where it will serve a clearly definable purpose. In the present economic situation local authorities will no doubt consider carefully before imposing additional costs on industry".

# Refuse Disposal

## *NSCA Memorandum*

*The Parliamentary and Local Government Committee of the Society has prepared the following Memorandum which on behalf of the Executive Council has been submitted to the Working Party on Refuse Disposal, set up by the Ministry of Housing and Local Government.*

There are three major interests which the Society have in stressing the direct connection between refuse disposal systems and the work of Clean Air agencies.

1. The scope of the public cleansing service in smoke control areas should be such as to eliminate the need for the disposal of refuse in small amounts at domestic, commercial and industrial premises.
2. The disposal of refuse including old motor cars other than by local authorities should only be permitted in plants or on sites licensed by the local authority under an extension of the Clean Air Act.
3. Local authority and other disposal plants and sites should comply with a code designed to eliminate the emission of smoke, dust and fumes, either during the handling of material or during combustion.

These points are elaborated below.

### (1) *Elimination of disposal by householders and in small industrial units*

In the desire to reduce the costs to the rate fund of the public cleansing service a blind eye has often been turned to practices which, in the context of present-day standards of living, should not be tolerated. Pre-war ideas of "burn your refuse and reduce your rates" are quite contrary to the principles of smoke control area work, and the dumping of unwanted articles destroys local amenities.

The Society welcomes the principle of the Civic Amenities Act which envisages a householder being able to dispose of the whole of the unwanted material arising at his house either through the regular refuse removal arrangements, or at the special sites to be provided by local authorities. This scheme will obviously work best in areas where the collection arrangements give the maximum service, and places the least reliance in the co-operation of householders, and the Working Party are urged to stress this aspect. Failure of the general acceptance of a comprehensive collection arrangement may well lead to a continuance of householders disposing of garden and other refuse by burning, and seldom is this done without distress to neighbours and a reduction in the value of controlling chimney smoke.

Similar collection arrangement, maybe at a charge, to deal with arisings at commercial and small industrial establishments, could eliminate attempts to burn refuse at these premises where it is most difficult to carry on this means of disposal without conflict with Clean Air principles.

### (2) *Control of larger disposal units*

Where a large amount of refuse is to be disposed of at residential, commercial or industrial premises, it may be sound economics to provide facilities for disposal on site, either by incineration, tipping or other treatment. Incineration requires the installation of plant which is capable of complete smokelessness under all types of load; tipping of light material can contribute to airborne dust nuisances, and the danger of fires in all tips has to be recognized; other plant, such as shredders, requires supervision for similar reasons. The disposal of old motor cars presents special hazards as the usual practice is to dispose of tyres and to remove upholstery, etc., by burning in the open. The Society believe that the need for the elimination of smoke, dust and fume nuisances justifies the registration of licensing of all these disposal units by the local authority.

(3) *Code of practice for disposal units.*

Many of the disposal plants now operated by local authorities and others are old and were designed without regard to the strict control of emissions that is required today. Their operation has also been seriously affected by the considerable changes which are continually taking place in the composition of refuse. There is a lack of recognized operation standards for disposal plants with regard to control of emissions, and research into associated problems has in the past been scanty.

The Society is of opinion that research should be accelerated and a code developed which should prescribe standards to achieve

(a) the elimination of incineration except in properly designed incinerators;
(b) complete smokelessness of incinerators and the elimination of dust and grit;
(c) the prevention of dust and grit becoming airborne during handling;
(d) stricter control of tipping to eliminate fire risks, and arrangements for the immediate extinction of fires which may arise;
e) the control of the disposal units, including shredders and pulverizers, to eliminate dust and grit.

*Rear-Admiral P. G. Sharp, C.B., D.S.C., who took over as Director and Secretary of the Society on the retirement of Arnold Marsh, O.B.E., M.Sc., F.Inst.F., on 31 May, 1968*

## Olympics Pollution

It is reported that air pollution, even the possibility of smog, in Mexico City, is worrying the Olympics Organizing Committee. A cement works across the road from Olympic Village has been informed that it must close down during the Games, and suggestions have been made that all the city's industries should close down for the period. Mexico City is not only over 7,000 ft. above sea level, but is in a valley surrounded by high mountains, giving conditions favourable to the trapping of pollution and the formation of inversion conditions. Breathing difficulties at the high altitude has created concern, and if the air is also polluted conditions for athletic brilliances certainly look less than good. Bearing directly on this is the paper on air pollution observations in Mexico City presented by H. Bravo A. and G. Viniegra O. at the International Clean Air Congress, London, in 1966. (Proceedings, page 252.)

# Programme for the Harrogate Conference

The programme for the 1968 conference at Harrogate, opening on 22 October, has now been completed and is given below.

The important session on Thursday afternoon, on clean air and future fuel usage, will in effect be a sequel or appendix to the opening address in the morning to be given by the Permanent Secretary of the Ministry of Power, Sir David Pitblado. As will be seen, the other sessions will also be of considerable interest and variety. Only one paper has been included in the closing session of Friday morning, on smoke control—this should make possible ample time for the discussion that this subject always raises.

The conference registration fee will remain as before, at £5, but an innovation this year will cater for persons who wish to attend only one session, or the two sessions in one day. There will be for them a special "day registration" fee of 30s, not including the printed papers.

## *The Programme*

**Monday, 21 October**

2030 Informal Gathering.

**Tuesday, 22 October**

1030 *Opening Session*
Civic Welcome by the Mayor of Harrogate, Councillor Alan Mais.
Opening and Address by Sir David Pitblado, Permanent Secretary, Ministry of Power.
Presidential Address.

1430 *Session* 2 "Clean Air and Future Fuel Usage". Papers on:
(i) Electricity, by P. A. Lingard, Member, Electricity Council.
(ii) Gas, by A. Hetherington, Deputy Chairman, The Gas Council.
(iii) Oil, by T. R. Grieve, Vice-Chairman, Shell-Mex and B.P. Ltd.
(iv) Solid Fuel, by Lord Robens, Chairman, National Coal Board.

2030 Civic Reception.

**Wednesday, 23 October**

0930 Extraordinary General Meeting (Members and their representatives only).

1000 *Session* 3 Chimneys. Papers on:
Design, by Dr. A. Parker.
Height, by Professor R. S. Scorer.
The Aesthetic Factor, by P. D. Spawforth, Planning Officer (Redevelopment) City of Leeds.
The Scheduled Processes, by F. E. Ireland, Chief Alkali Inspector.

1430 *Session* 4 The Measurement of Pollution. Papers on:
The National Survey, by the Warren Spring Laboratory.
The Monitoring Work of the C.E.G.B., with special reference to techniques and instrumentation.
(i) The Measurement of Grit and Dust, by D. H. Lucas and W. L. Snowsill.
(ii) The Measurement of Sulphur Dioxide, by W. G. Cummings, E. G. Kingham and F. R. Barber.

**Thursday, 24 October**

1000 *Session* 5 Road Vehicles. Papers on:
The Warwick Street Investigation, by W. M. Lewis, City Analyst, Coventry, and J. Bullock, Chief Public Health Inspector, Warwick.
The Abatement of Pollution from Petrol Vehicles in Britain.

*A recent photograph from the air of Gloucester, showing the pall of domestic smoke. The city is not in a "black area" and so far has only 85 acres smoke-controlled*

by R.A.C. Fosberry, Motor Industries Research Association.
Progress with Electrical Vehicles, by Dr. M. Barak, Chloride Electrical Storage Co. Ltd.

*Afternoon:*
Technical Visits and S.S.F.F. Golf Tournament.

*Evening:*
Conference Dinner.

**Friday, 25 October**

1000 *Session* 6 Domestic Smoke Control.
Paper on "Practical Problems in Introducing Smoke Control" by J. Harris, Chief Public Health Inspector, County Borough of Doncaster.

1200 Close of Conference and Exhibition.

## Obituary

We regret to have to record the death of Councillor William Monteith, of Glasgow, for a number of years a Scottish representative on the Executive Council, and until recently President of the Scottish Division. We also regret to record the death of one of the Society's Vice-Presidents, T. C. Finlayson, former chairman of the Woodall-Duckham group of companies: a firm which not only helped to make a major contribution to clean air through its products, especially its vertical retorts for the manufacture of reactive domestic coke, but which also materially helped the Society as a generous contributor through some difficult patches.

# *Retrospect and Prospect*

### *An Address to the Annual Conference of the Scottish Division at Hawick on 23 May 1968*

### by Arnold Marsh

FIRST thoughts for an address to mark impending retirement made it seem a difficult—and obviously unaccustomed—exercise. To review the years one has spent doing a job might, it seemed, be agreeable to the speaker, but might equally be boring to his audience.

But further reflection suggested that the occasion was to be welcomed as an opportunity for doing something that should perhaps be done more frequently. The story of the Society should be of interest to its present members, and to be aware of it might be helpful for assessing our present condition and in indicating the direction to be followed in the future. A Society such as ours, established for a specific purpose, is an organic body, composed of individuals who come and go over the years, but who maintain an unbroken life and form for the organization. The organization may grow, or may in the course of time shrink, but there is a continuity back to the day of its birth. Today's members cannot belong as closely as they might if they know little of its past, and know especially how it grew and what it has achieved.

The birth of the Society was a very humble one, and it is hard, today, to appreciate the problems that faced the small group of individuals who, in 1899, got together in London to set up what they named the Coal Smoke Abatement Society. Not only had they to face the apathy of the public, but the active opposition of industry, and even of the local authorities and the central government. The Society was regarded as an unpractical collection of cranks, and Dr. Des Vœux, its chief inspirer, used to relate how on one occasion a London councillor told him that when he grew tired from his efforts they had a nice rest home for him—and named one of the mental hospitals. Members were few and funds were low, but in the course of a few years it became possible to employ a private smoke inspector, on whose reports representations were made to the apathetic authorities, demanding action under the smoke abatement provisions of the Public Health Act of 1875. In one year, early in the century, the Society made no less than 1278 complaints. It also began to make investigations, first on domestic firegrates, to try to find designs that would reduce smoke, and then one on gas fires.

The Society concentrated its attention on London, but in 1909 representatives from provincial cities held a conference in Sheffield, as a result of which another smoke abatement organization was born, the Smoke Abatement League of Great Britain. This body made its headquarters in Manchester, with a section in Glasgow, and soon began to press for new legislation.

About this time, too, the Society in London was developing means for the measurement of air pollution and encouraging the taking of readings: it was a small beginning to a survey that was later taken over by government agencies and which is continued today by the Warren Spring Laboratory.

In 1912 the movement was strong enough to organize an exhibition in London and to hold with it the world's first international conference. This passed resolutions demanding a new smoke abatement law and a Royal Commission to investigate the problem. In co-operation with the League in Manchester and Glasgow and the help of a few members of Parliament agreement to an official committee of inquiry was secured, but the 1914-18 war brought everything to a halt. Soon afterwards however a government committee was appointed, with Lord Newton as its Chairman, and in 1921 it produced a report that, even then, was regarded as only moderately satisfactory. One statement in the report has always intrigued me, for it seemed to get to the heart of the problem as it faced our predecessors. It said: "Perhaps the chief factor in the failure to deal with the smoke evil has been the inaction of the Central Authority. No Government has, for many years, taken any action with the exception of appointing committees, whose labours have had little or no result".

Perhaps it was the sting in this comment that enabled the two organizations to persuade the Government to introduce a bill, which became the Public Health (Smoke Abatement) Act, 1926. But, alas, because of the opposition of industry to what it regarded as more interference, this proved to be a disappointing measure both in its provisions and the way in which they came to be applied. Once again, because of a lack of official concern, this Act was never fully implemented. It contained nothing to enable even a start to be made on the reduction of domestic smoke.

The smoke abatement societies had therefore much to continue to strive for, but they were still weak on the ground, and both relied on part-time or honorary secretaries. Membership was small, and that of the London Society appears to have been dwindling. It was then, in 1928, that the provincial League, thanks to the courage of a handful of enthusiasts, led by its chairman, Will Melland, a Manchester business man and alderman, took the bold step of deciding to appoint a full-time secretary. It was bold because the funds were in the red, and was made possible only because of three guarantees of £50 each for three years, which at least ensured three-quarters of the salary to be paid for that period!

It was then and thus that I came on to the scene as the League's first full-time officer, to work, at first single-handed, in a small back room behind Melland's King Street office. It was a gamble on both sides, but it came off, and the credit is due to the League rather than to the individual they happened to appoint. It was having someone on the job, all the time, and dependent on the job, that made all the difference. It became possible to begin to build up membership, to start the quarterly journal that later became *Smokeless Air*, and to inaugurate the now long series of annual conferences.

### The Union

The first of these for which I was responsible was in Harrogate in 1928, attended by about forty persons. The second was in Buxton in 1929, jointly with the London Coal Smoke Abatement Society, and it was here that the two organizations agreed to amalgamate and form the National Smoke Abatement Society. Dr. Des Vœux became President and remained in that position until his death in 1943. Headquarters were in Manchester, but there was still a London office, with the former CSAS secretary, Lawrence (later Sir Lawrence) Chubb as Hon. Advisory Secretary. Chubb had become increasingly concerned with his other amenity organizations, especially Commons and Footpaths and National Playing Fields, but his interest in the Society remained and later for a time he was to become its Hon. Treasurer. The new young secretary in Manchester was fortunate in finding in him a valued friend and counsellor.

The period from 1929 to 1939, when there was another unfortunate interruption, was marked by the steady growth of the Society, especially in its influence, and the crystallization of practical policies for securing cleaner air. Chief among these was the birth and development of the smokeless zone principle, as a means for overcoming the hitherto neglected domestic smoke problem. This was the inspiration of the Society's new chairman, a Manchester barrister, Charles Gandy. It is difficult to say whether the Society owes more to him for his brilliant (and successful) idea or his leadership, over a number of years, when his wisdom and the quiet uprightness of his character were of inestimable value in building up what today we would call the image of the Society, as a reasonable and authoritative body.

This was demonstrated by an important landmark of the period: the holding in 1935 of an air pollution exhibition of a scientific character at, and in conjunction with, the Science Museum in South Kensington. With this was held the annual conference, which was the first to be opened by a Minister of the Crown. These two events further helped to raise the Society's status, and this led to a decision to move headquarters from Manchester to London. This was done in 1936, and by 1939, with the appointment of an assistant secretary, the staff had grown to a total of three. The war reduced this to one again, but fortunately it was possible to keep the organization intact during the war years, and even to maintain publication of an attenuated but regular *Smokeless Air*.

A word might be said here about this journal. I have had the privilege of initiating and maintaining the first ever periodical devoted to clean air, and I have tried to make it not only the mouthpiece of the Society but also a means for keeping all members informed and interested. Only a minority of members attend meetings and conferences, and contact with the majority must be through the printed word. Hence an effort has been made throughout to make the journal one that would be varied and readable, and have something of interest to all members, and not just to the technical élite. I think that the journal has helped to hold the Society together during difficult and uncertain times, as during the war, and although there may have been times when I may have wished for at least a temporary release, there has been a sense of satisfaction in maintaining what I like to think has helped to bond the Society with all its members. An editor is fortunate if he is allowed to get on with his job, and I am grateful that no committee has concerned itself with the contents or production of *Smokeless Air*. The journal was especially valuable during the war years and during the early post-war period, when there was an almost complete absence of meetings of members or of committees, and it became the platform for the discussion of the problems of the way forward towards the next and most vital phase of the Society's story.

## The Post-War Advance

Despite the obvious difficulties that then prevailed, this was the period which personally I feel was the most fruitful of the whole of my time with the Society. It is also an example of what a movement that has a good case can accomplish even on the thinnest of funds and of organization. Even before the war was over the problems of reconstruction and redevelopment began to be discussed, and the moment was seized to show that in housing, in new towns and new industry, and in policies for fuel and power, there were opportunities to prevent the emergence of new sources of air pollution and for making a vigorous start on the abolition of those in existence. Smoke abatement—clean air was not yet a term in general use—should and must be pressed for and be made a basic factor in post-war planning.

It would not be right or proper to claim that the Society alone was responsible for the steady acceptance of its views, but it cannot be doubted that the changing climate of opinion—informed, responsible, opinion—was greatly influenced by the persistent and yet always reasoned and balanced advocacy over the years of a positive clean air policy by the Society. Among the Society's publications of the time were a *Memorandum on Smoke Prevention in relation to Initial Post-War Reconstruction*, a popular pamphlet called simply *No Clean City*, another for local authorities entitled *Smoke Control*, and a quiz form of pamphlet called *Plan for Clean Air*, and still another setting out the case for *Smokeless Zone*.

So it was that the spate of official inquiries and reports that began towards the end of the war and continued through the 1940s, began to recognize the importance of clean air, and for the first time accepted that something must be done about domestic smoke. There was the *Housing Manual*, the Egerton report on *Heating and Ventilation of Dwellings*, the Simon report on *Domestic Fuel Policy*, and the Ridley report on *National Policy for the use of Fuel and Power Resources*. All were welcome grist to the Society's mill, and an endorsement of the things for which it had been pleading.

With this advance in the acceptance of clean air policy there began a rapid growth of the Society itself. Among the local authorities alone, so many of whom had been indifferent, membership grew from 150 or so before the war, to 600 in the post-war years. It became possible to set up divisional councils, and the annual conference grew from 100 to 200 delegates to around 1,000. The influence of the Society began to be apparent in many ways; the case for clean air was strengthened, as were positive practical policies for securing it. The attitude of government departments began to change, as did that of industry. Even on the domestic side the hitherto implacable suspicions of the coal trade began to show signs of change as the possibilities of solid smokeless fuels, using the improved types of open fire and other appliances, began to be recognized. New legislation was demanded, and proposals for it were advanced and discussed. But it was known that there was still a long way to go, and that although informed opinion was being won over, there was much to do to convince the general public of the need for reform. The smokeless zone principle became widely accepted, and local authority private acts were incorporating provisions for smokeless zones, which were being created now up and down the country, and were being found to work successfully.

### The Catalyst

Then came the event that catalyzed the situation into the kind of action that was needed: the London smog of 1952, a disaster that was to produce much good. It was a sharp reminder of the dangers of air pollution and it led to the setting up of the excellent Beaver Committee, the presentation of its report, and finally the Clean Air Act, 1956. The Beaver Report was essentially an authoritative statement of what the Society had been saying and urging, and was therefore a valuable endorsement of its policies.

### Present Tasks

This brings us to the present phases of the struggle for clean air. Through the Act we are now witnessing a steady reduction in industrial smoke and in grit and dust emission—about to be tackled more effectively—and on the domestic side a smoke prevention programme that, although it is moving more slowly than either the Society or the Beaver Committee had hoped for, is nevertheless on a scale that makes eventual complete success inevitable.

There is of course still a great deal to be done to help achieve the objectives of the Act, both in industry and in the domestic sector. Although Greater London has passed the two-thirds mark in smoke control there remains a formidable task in encouraging smoke control in many areas in the midlands, the north, and in Scotland. Domestic smoke is now the most serious and widespread constituent of air pollution in Britain, and to accelerate progress towards its abolition must remain one of the Society's primary tasks in the coming years. It is in this field that the Society can continue to help by education and publicity.

Industrial pollution, though diminishing, demands constant vigilance, and there are still black spots here and there. It is also necessary to keep a watchful eye on the emergence of new sources and types of pollution and to support the efforts of both the local authority inspectorate and of the Alkali inspectorate. It is satisfactory to know that certain, formerly severe, classes of pollution have virtually disappeared—notably railway smoke and the once formidable problem of pottery emissions.

There still remains the intractable question of pollution by sulphur dioxide, and on this it is difficult to say more than was written in the Society's report on *Sulphur Dioxide as an Air Pollutant*. This is a many-sided problem, for which no simple single solution is likely. This alone is likely to keep the Society busy for quite a number of years.

And now we have a rapidly growing form of air pollution—that from motor vehicles. The Society has been giving this subject close study, and must continue to do so. Diesel smoke, which is technically easy to overcome, is already coming under more effective control, but the pollution from petrol vehicles will be a problem for a long time ahead. This question has also been reviewed recently by the Society, in its report *Air Pollution from Road Vehicles*.

The latest medical evidence on the health effects of vehicle pollution is largely negative, which is reassuring from one point of view, but makes the case for controlling emissions depend more and more on amenity grounds, unless we can include what Lewis Mumford has summed up as "all the forms of psychological deterioration from apathy to outright neurosis". Vehicle emissions are in any case a most objectionable form of pollution, and with the growth in motor traffic that is forecast this will be experienced much more widely in the future. Even improved, pollution-reducing, engines, for which we are now pressing, may not counterbalance the larger number of cars that will be on the roads. The Society will need to continue to give the problem close and continuing attention, and a personal hope is that it will ally itself to the growing demand for carless zones, traffic-free streets, electrical vehicles, and so on. These are desirable of course not only for clean air reasons, but for general amenity, security, and quietness.

## The Future

The Society's present and future situation as a voluntary organization is, to one who has seen it through both vicissitudes and successes, no more and no less a matter for anxiety than it has been in the past. Dependent as it is on the support of its members, it is at the moment feeling to some extent the effects of the difficult national economic situation. This has not in any way weakened the Society but it is hindering the growth we have been hoping for to carry out more effectively the tasks that should be done. Growth, or at least change and development, is essential for a body such as ours, and efforts are now being initiated to strengthen our funds: efforts which it is hoped every member will generously support.

The Society has always drawn its strength—and it was gratifying in a recent book* to see it described as "a powerful organization"—from its independence of any sectional interest. This it has done by enlisting the support of all sectional interests that are in one way or another concerned with clean air. It has made itself an open forum, and therein lies the value of its conferences and its journal.

The Society has changed considerably in the forty years I have been privileged to serve it. In growing it has increased many times its influence, and it may be mere nostalgia that makes one regret a little the loss of the intimacy and informality that was possible in the early days. Growth has called for a greater need for formality and elaboration of administration. The proliferation of administrative demands is something that may threaten any organization and it is necessary to keep it in hand, or it tends to become of greater importance than the pursuit of the objectives for which the organization exists. It is a kind of institutional hardening of the arteries, and although the Society has so far averted this condition, it should be alert to its insidious danger.

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* *Man and Environment, by Robert Arvill, 1967.*

This is particularly important with an organization existing to achieve a specific reform. It can achieve full success only by making itself no longer necessary. That is the Society's ultimate goal, but, I hasten to add, it is still a long way off, and until the time arrives it must maintain itself strong, influential, wise, and always flexible in its approach to the new conditions that it is itself helping to create.

This perhaps rather obscure utterance leads to a few words of surmise about the future of the Society and its work. Already it is having to adjust itself to changing conditions, and this will have to continue as problems are solved and this or that class of pollution disappears. What seems possible, is that as the grosser, more obvious pollutants are overcome—dark industrial smoke, grit and dust, and the sickly smoke of domestic chimneys—standards of air quality will rise, and what may today be regarded as minor pollutants will in their turn begin to create public disapproval. Thus fumes and odours already seem to be more noticeable than they were, and there appears to be a rising volume of complaint about garden bonfires, even though with the growth of composting these may be diminishing. There might be much for the Society to watch even when the major tasks are completed.

### The White Environment

On the other hand the Society may find unexpected opportunities in forming closer links, and even federating, with other bodies concerned with other environmental problems. The environment is under constant attack in this age of technological advance, and it appears that those who are defending one or other sector should in some way get together in the defence of the environment as a whole. The problems are many, and include the defence of the countryside, the defence of urban life, air pollution, water pollution, noise, litter, pesticides, herbicides, radiation, and the control of the motor vehicle. These problems call for different kinds of study and remedy; each problem demands its own special discipline; they cannot feasibly form into one super-organization. But they could move towards some form of federation, could join in their appeal to the public and the authorities, and generally develop and foster the idea that if man is to succeed in preserving and improving his environment he must think of it as a unity.

This concept has already found roots in the United States, where the degradation of the environment may have gone further than it has here. We should not be afraid of following this lead, and it is a personal hope that as the principle is discussed—and it has a long way yet to go—this Society may be able to take an active and perhaps a leading part.

What has perhaps kept me with the Society for these four decades, despite some frustrations, and apart from a fervent belief in the rightness of the cause, has been a constant sense of challenge throughout. Every hurdle that was cleared showed that there was still another ahead. The Society, and that of course has included its Director, has never been able to sit back and rest upon its laurels, and it is my hope and my belief that this will continue to be so in the future.

# *Presentation to Arnold Marsh*

On 26 April, 1968, in the Connaught Rooms in London, the Society reached another landmark in its history.

Just after the formal business of the Annual General Meeting and before Lord Kennet addressed the Open Meeting, the President, Sir John Charrington made a presentation on behalf of the Society to Arnold Marsh, its Director. The presentation took the form of a cheque and of an Album in which are recorded the names of all subscribers to the Presentation Fund.

Here, it must be made clear that at the time of the presentation, Mr. Marsh had not retired. He remained as Director until 31 May. The presentation was made, however, on the occasion of the Society's Annual General Meeting as this was the most opportune and fitting time to do it.

Sir John referred to Mr. Marsh's forty years of service with the Society, and his accomplishments in that time one of which was unique in that Mr. Marsh was the only person outside the United States to receive the Richard Beatty Mellon Award of the Air Pollution Control Association in formal recognition of outstanding achievement in the control of air pollution. Sir John then read the following Citation which has been reproduced in an illuminated form in the front of the Album:

*NATIONAL SOCIETY*
*FOR CLEAN AIR*

*In recognition of the devoted service in the promotion of Clean Air by Arnold Marsh, Esquire, O.B.E. M.Sc.Tech., F.Inst.F., Secretary, and latterly Director of the Society, his many friends listed in this Album have*

*The President, Sir John Charrington, presenting the Presentation Fund Album to Arnold Marsh* *contributed to a Presentation and wish to convey their profound thanks and esteem for his untiring efforts in the cause of Clean Air from 1928 to 1968 and sincerely hope that he will enjoy many years of good health and happiness in his well-earned retirement.*

Mr. Marsh having accepted the cheque and the Album, which is bound in blue morocco leather with the head of John Evelyn emblazoned in gold on the front cover, thanked Sir John Charrington and all subscribers. He remarked that unaccustomed though he was to retiring he would always remember the occasion; and although the cheque would go the way of all good cheques, the Album would be one of his most treasured possessions as long as he lived.

Writing as the Director Designate of the Society, I would like to remind all members and readers that the Presentation Fund has not yet closed and the presentation made by the President was an interim one only. If you have not yet subscribed and wish to do so—and I may say that at the Annual General Meeting I met a number of people who realized then that they had not done so—will you please send your subscription to the Society's Honorary Auditors, Messrs. Geo. Little, Sebire & Co., Adelaide House, London Bridge, London, E.C.4. marked "Arnold Marsh Presentation Fund". The names of all subscribers will of course be entered in the Album.

P. G. Sharp, *Director*.

## S.S.F.F. REPORT

The Solid Smokeless Fuels Federation (York House, Empire Way, Wembley, Middlesex) has published its annual report for 1967. The year, it is said was a busy one for the Federation, and the report bears out the useful activities undertaken, especially in educational and publicity activities in connection with the setting up of smoke control areas.

Exhibition units and leaflets have been widely used, and the mobile exhibition was operated to its maximum capacity. Altogether 194 weeks of exhibitions were organized. Arrangements were made to visit 130 local authorities, and the exhibitions toured some 225 smoke control areas, before or after confirmation.

The report says there have been very few complaints of fuel shortages during the year; most types and makes of solid smokeless fuels have been in adequate supply. Sales of solid smokeless fuels, particularly the more reactive fuels, have increased considerably in Scotland.

Arrangements were made during the latter part of the year to make available a wider range of open fire fuels in the Northern Region. Coalite, Rexco, and BurnBrite will be supplied in increasing tonnages to meet the run-down in production by the Northern Gas Board and to enable local authorities to offer freedom of choice to householders in future smoke control areas.

### Asbestos and Lung Cancer

Every time a person applies his car brakes, he may be polluting the air with a substance suspected of causing cancer, according to Dr. W. A. D. Anderson, of the University of Miami School of Medicine.

The substance is asbestos, widely used in brake linings. It also is found in roofing and insulation.

Dr. Anderson has found tiny asbestos fibres in the lungs of 31 per cent of the men and 20 per cent of the women in a group of 500 persons studied at random in Miami.

"Surveys in other cities have shown asbestos in the lungs of up to 50 per cent of cross-sections of the population," says Dr. Anderson in a report released recently at a symposium for science writers sponsored by the American Cancer Society.

# *Stone Cleaning*

## by K. J. Negus*

A NEW significance was given to the business of cleaning and restoring buildings by the passing of the Clean Air Act of 1956, whereby local authorities had to designate "smoke controlled" areas in which efficient methods of heating have to be installed to prevent, amongst other things, erosion by smoke. The reduction of smoke pollution in this way meant that for the first time the effect of restoring properties to their former dignity would be long lasting. In an area of atmospheric pollution the periods between cleanings are estimated by London Stone to be four years whilst in a smokeless zone they will be anything up to 10 years. If these times are considered in relation to the period allowed to lapse between the painting of exterior fittings of a building, it is very reasonable.

More and more building owners, and their professional advisors, are becoming aware of the value of regular building cleaning, but in spite of this there is still a body of opinion which regards the operation as one of pure luxury. The rational basis for this belief was demolished as early as 1932 when R. J. Schaffer's *The Weathering of Natural Building Stones* first appeared. The publication was produced as a result of an inquiry carried out by the Department of Scientific and Industrial Research (now embodied in the Ministry of Technology), and still stands as a definitive work on the subject.

Schaffer states: "From the practical point of view there can be no question that soot and dirt are undesirable since their presence on buildings causes decay. The oft repeated statement that soot deposits form a protection to the stone work is erroneous".

Decay and erosion are carried out by the highly deleterious products of chemical reaction between air and moisture and the building fabric. Cleaning removes these products and also assists in the removal of salts produced locally in the stonework by exudations, from the mortar or the ground by the action of fumes.

Cleaning also enhances and maintains the natural colour, elegance and architectural character of the building and assists in the reflection and diffusion of light into rooms and streets from the bright cleaned surfaces. At a time when so much stress is placed by the planners and sociologists on providing a decent environment for our city-orientated population to live and work in, this is an important consideration.

Having decided that the cleaning of a building is a worthwhile operation, the timing of the clean is the next problem. Those organizations who accept the need for regular cleaning as a matter of course and include it in their regular maintenance programme naturally like to make maximum use of access scaffolding, one of the heavy cost factors in external building works of any kind, and carry out cleaning when other maintenance work is done.

There is a school of thought, however, that firmly believes that programmes of this kind must be carried out at the same time and in the same spirit as the domestic spring clean. Cleaning is a round-the-year function and dry cleaning techniques introduced and developed during the past few years enable it to be carried out in the winter months.

Many will, of course, object that

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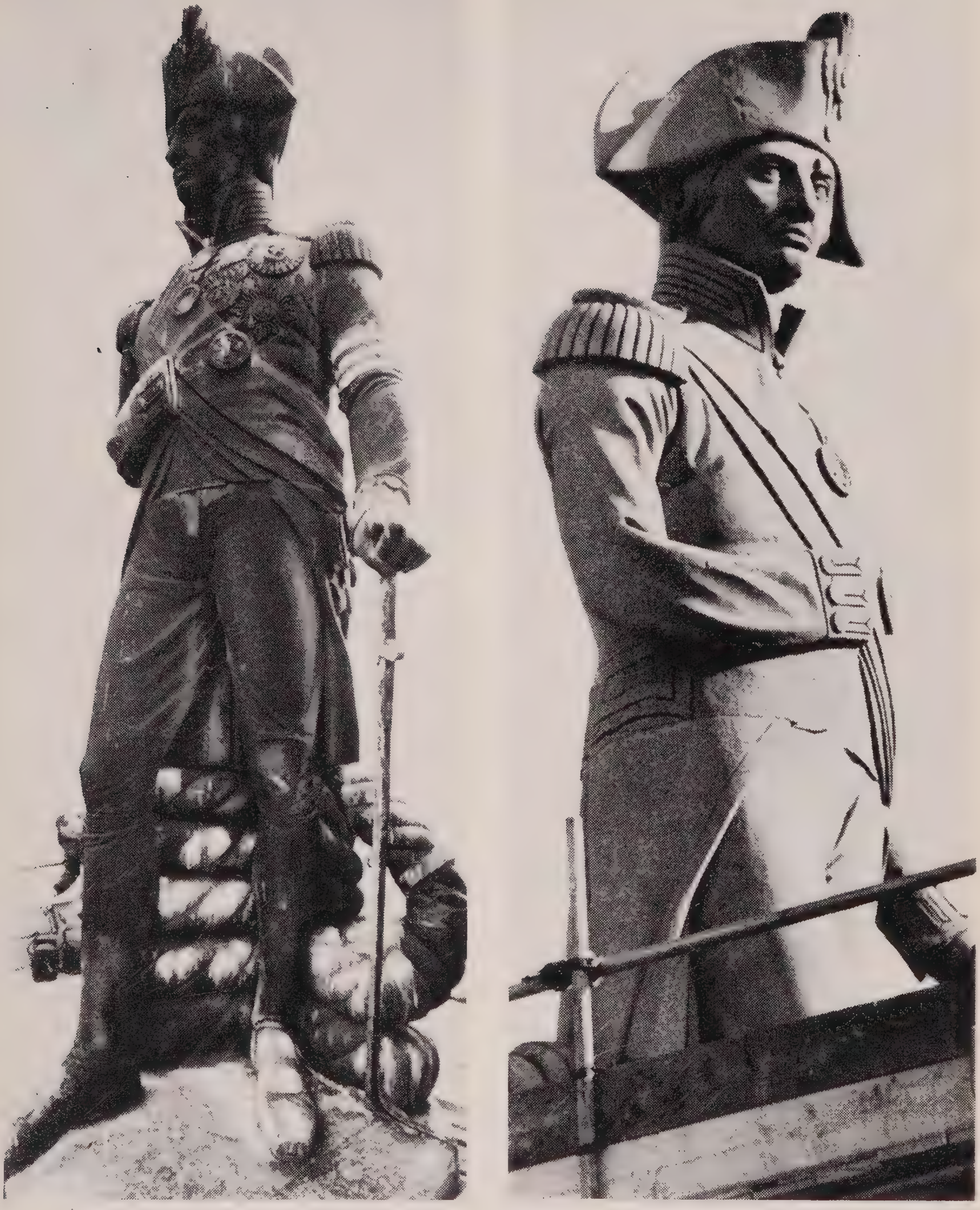
* *Director of The London Stone Cleaning & Restoration Co. Ltd.*



*The scaffolding up the Nelson column provided a rare opportunity for these closeup photographs—before and after cleaning*

paint renewal cannot be carried out at this time and nobody wants to pay for two lots of scaffolding. The latter point is accepted, the former is not. If damp atmospheric conditions really did exclude the possibility of painting, there would hardly be a dab of paint on anything past the Manchester Ship Canal—but they manage up there.

Bearing in mind that scaffolding is probably one of the biggest single items of expenditure, there is a sound economic consideration for winter cleaning as well, simply that scaffolding is cheaper to hire during the winter months. For many organizations the winter is the most convenient time for this kind of work to be carried out. Scaffolding is, at any time, let us admit, a nuisance. In the winter employees are not worried about what is going on outside and they tend to keep the window closed most of the time, thus the operation loses a lot of its nuisance value.

### Techniques

There are many techniques used for cleaning and they vary according to the nature of the fabric and the kind of finish required. While it may appear a simple operation at first glance, a great deal of skill and experience is necessary to complete a cleaning operation successfully and satisfactorily without damaging the fabric.

It is possible with some buildings, particularly those constructed of Portland Stone, to clean by the use of cold water delivered through hoses issuing fine misty spray. This is done in conjunction with brushing and rubbing with various types of brushes and rubbing stones all selected to suit the particular type of stone or brickwork.

Some structures, because of their design, do not lend themselves to wet cleaning and in these cases steam cleaning may be used. This process is also employed a lot on industrial contracts for de-greasing floors and de-camouflaging, (even 23 years after the war there is still a demand for this service). Saturated steam at 100 lb. per square inch is delivered through special jets which are fitted with phosphor-bronze brushes. The temperature of the steam combined with brushing assists in dissolving the dirt accumulation.

Many stones, like sandstone, being highly porous, absorb soot and dirt to quite a depth. In this case the building needs a "Shave", or to use the correct term, resurfacing. This method involves the use of mechanical carborundum sanding machines which remove the weather and grime faced skin resulting in a return to the original colour of the stone. The resurfacing is used particularly for ashlar (plain stone) and on hard varieties of brickwork such as stock and gault, where normal water cleaning removes superficial dirt and soot deposits, leaving a weathered and aged appearance. Refacing must be carried out if a new appearance is required and while this can be done by hand, it is obviously much quicker to use the mechanical spinning method. The resurfacing does not harm the stone or brickwork in any way and has no effect on its weathering qualities or durability.

The dry cleaning method, mentioned earlier, is by discharging fine abrasives by compressed air, in other words grit blasting. Millions of tiny angular particles are discharged in a fine spray through specially designed nozzles. The important fact about this new system is that the compressed air which carries the abrasives to the surface can be regulated over a very wide area—an important point when one considers the acres of barren brick which form a feature of so many modern buildings.

On work of this kind, the equipment is set to a safe maximum pressure and it is possible for large areas to be thoroughly cleaned in a short time. There have been doubts cast and criticisms made regarding the use of this new system. Some perfectly reputable authorities have claimed that it damages the fabric of the building, wiping away the outer skin. Of course it will if it is not used by an expert, and companies like London Stone spend a lot of time training their operatives for work of this kind.

The best answer to the critics is to point to the recent decision of the Ministry of Public Building and Works to use grit blasting techniques for the cleaning of Nelson's Column and for the rest of its £60,000 investment in the cleaning of public buildings and monuments in the coming year. These buildings which include the Cabinet Offices and the Old Treasury Building, are hardly suitable structures for use as guinea pigs.

Grit blasting is somewhat more expensive than water cleaning per square yard, but it is much faster.

London Stone have just developed a technique whereby it can be successfully and safely applied to almost all forms of brickwork. The research work carried out by the company's Scottish subsidiary has been subsequently verified by the Glasgow Building Research Station. This technique is ideal for winter working and eliminates the need for water of any kind. It does create a little dust, but this is a small consideration when it is employed during the winter months.

There are many other interesting weapons in the armoury of companies like London Stone. For instance, they can provide complete bird repellent systems, treat fabric with preservative and water repellents and restore them when necessary where damp, frost or metal corrosion have left their marks.

Looking to the future it seems certain that the £3m. a year stone cleaning industry will continue to grow, although if current trends are anything to go by, the pattern and scale of operations is likely to change.

Inspired, in part, by the Gaullist legislation which lead to the clean-up of Paris, communal cleaning campaigns are already being discussed in the U.K. One is already under way and another will be off the drawing board shortly, all being well.

In the North West region a major spring cleaning campaign to culminate in June 1968 has been organized. The campaign known as "Operation Spring Clean" has, as its object, the cleaning up of the whole region and the stimulation of people to keep it that way (do not be mislead by the name, a lot of cleaning work has been going on during the winter months). So far response has been good and other regions are watching progress with interest.

In Glasgow there is a smaller but no less important scheme afoot to clean and restore the Park Circus area of the city which contains some of the finest early Victorian houses in the county. If the scheme comes to fruition, Glasgow will have an architectural gem that will rival the best of Bath.

It is likely that other cities will follow suit and that the stone cleaners are going to be faced with tasks of increasing magnitude and complexity. London Stone, with its subsidiary companies all over the country, is already equipped to face this exciting challenge.

## Sheffield and District Committee Report

The 1967 report of the statutory committee shows a further improvement in the quality of the air of the city and its environs. The average pollution by smoke (in microgrammes per cubic metre) has decreased steadily from 326 in 1956 to 94·4 in 1967. For sulphur dioxide there has been a similar, though not so marked, fall; from 285 in 1956 to 147 in 1967.

In addition to the excellent progress with smoke control areas industrial pollution continues of course to be carefully watched. Nearly 12,000 chimney observations were made, showing an average smoke emission per half hour of 0·21 minutes. 19 abatement notices were served and there were seven prosecutions.

The report says that one of the most significant signs of progress int he industrial sector has been the acceptance by the steel industry that the vast volumes of "brown fume" given off from their furnaces when using oxygen had to be controlled. On the smallest of the furnaces control equipment costs of up to £8,000 are involved and the larger furnaces entail a cost of up to £100,000. Such equipment is tailor-made to suit individual requirements and there are still problems in operating the plant which remain to be solved. Knowledge and experience in this field have been bought at a high price.

Two hundred Derbyshire miners are to test the new domestic coal-burning appliance reported to be in process of development by the National Coal Board. The appliance is reported to have been designed to allow bituminous coal to be burned smokelessly, but so far no technical information has been released.

# *INTERNATIONAL SECTION*

## REPORT FROM SOUTH AFRICA

The promulgation of the Atmospheric Pollution Prevention Act was reported on page 185 of *Smokeless Air* No. 137. It was there recorded that none of the main parts of the Act would be enforceable except in areas which have been declared for the purposes of a particular part by the Minister of Health.

The powers to control dust, vested in the Chief Officer for the Control of Atmospheric Pollution, have been delegated to the Government Mining Engineer, and extensive tracts of proclaimed gold mining land in the Transvaal and Orange Free State provinces have been declared for the purposes of Part IV (dust control). This means that owners are responsible to the G.M.E. and his inspectors for the control of dust from large dumps and dusty processes.

By April, 1968, Part III of the Act (smoke control) has been declared to be applicable to some 25 local authority areas. In eight of these cases, the standard smoke control regulations approved by the Minister of Health and the National Air Pollution Advisory Committee have also been proclaimed to apply. Besides Durban, which city has long had smokeless zones (authorized by provincial legislation), the City of Johannesburg has been the first to proclaim any smokeless zones (in terms of the national Act).

At least one company group has commenced marketing a variety of char as solid smokeless fuel in Johannesburg. It is sold under the trade name of *Kleenheat*.

In the Western Cape Province, at the other extreme of this country, two large local authority areas have been declared. They are, the area of the City Council of Cape Town and that of the Cape Divisional Council. The latter is a county-type authority which runs a combined health scheme for most of the peri-urban municipalities clustered around Cape Town.

By the time this account is published, there is likely to be an acting Chief Officer for the Control of Atmospheric Pollution, so that the Implementation of Part II of the Act (scheduled industries) may commence. Already power stations have been added to the 28 processes originally scheduled for registration and control. It is expected that many further process types will soon be added, thus bringing the total close to the more than 50 types of works scheduled in terms of the British Alkali Act.

Towards fulfilment of its statutory duty of providing favourable publicity for the clean air effort, the National Committee sponsored a national conference on air pollution at Camps Bay, Cape Town, in October, 1967. Some two hundred delegates from the larger local authorities and from industries all over the country attended.

The conference was very fortunate in being favoured by the presence of the Chief Alkali Inspector for England and Wales, Mr. F. E. Ireland. Mr. Ireland delivered his talk on the approach used by his Inspectorate with a wit and facility only matched by the twinkle ever present in his Lancashire eyes. During the two weeks preceding this event, he had delivered a series of addresses in various major centres. Subsequently, Mr. Ireland and his charming lady were taken on a week-end visit to the famed Kruger National Park by their hosts, Dr. and Mrs. Halliday. Dr. Halliday not only heads the Air Pollution Research Group at the C.S.I.R., but is also chairman of the National Air Pollution Advisory Committee.

At the Cape Town Conference an action committee was formed to investigate the possibility and desirability of forming a national association for clean air in South Africa. At date of writing (April, 1968) the result of sending out a questionnaire regarding possible membership, is still being awaited. The action committee has agreed in principle that the formation of an association is highly desirable. If formed, it would seek affiliation with the I.U.A.P.P.A.—

*C. E. Latsky*

**In Johannesburg**

The first air polluters in Johannesburg's new central smokeless zone have been given warnings to stop bellowing smoke or face R200 fines.

Yesterday was the first day on which air pollution by smoking chimneys became an offence in central Johannesburg, Hillbrow, Wanderers View and parts of other surrounding suburbs.

The City Health Department's six anti-pollution inspectors warned individual property owners with smoking chimneys that they were breaking the law.

The Air Pollution Control Officer, Mr. L. E. Tucker, said today that his office had been "a madhouse" with people reporting smoke and many others asking for extensions on the smoke ban. *Johannesburg Star,*

*23 January, 1968*

*U.S.A.*

# DESIGNATION OF NATIONAL "ATMOSPHERIC AREAS"

Eight atmospheric areas covering 48 States have been defined by the Department of Health, Education, and Welfare as a preliminary step toward designation of air quality control regions. Under the Air Quality Act of 1967, signed into law last November 21, definition of atmospheric areas is a required step in the development of a system under which States will be called upon to develop and apply air quality standards to deal with air pollution on a regional basis.

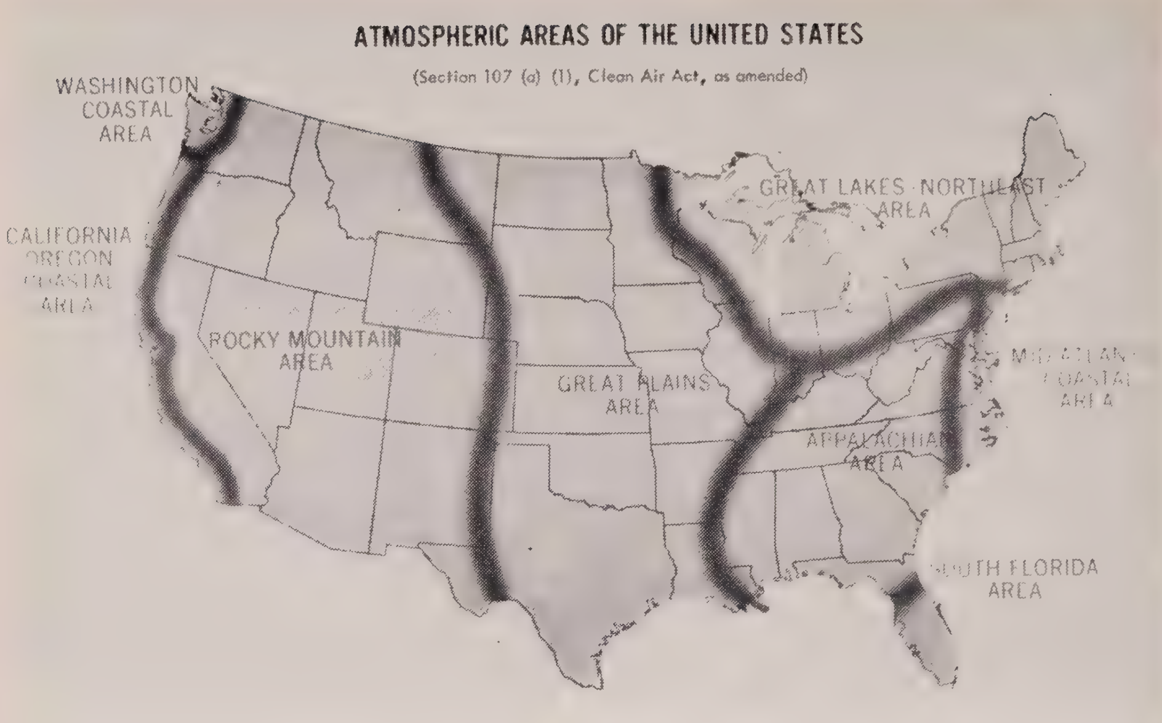
Several additional steps must be taken by the Department before States will actually be obligated to develop air quality standards.

The eight atmospheric areas defined in the *Federal Register* of 16 January, 1968 are the: Great Lakes-Northeast, Mid-Atlantic Coastal, South Florida, Appalachian, Great Plains, Rocky Mountain, California-Oregon Coastal, and Washington Coastal. Areas covering Alaska and Hawaii will be defined later.

Each atmospheric area is a segment of the country in which climate, meteorology, and topography—all of which influence the capacity of air to dilute and disperse pollution—are essentially homogeneous.

The next step will be designation of air quality control regions, which will include groups of communities, in the same or different States, that share common air pollution problems. Air quality control regions will be designated on the basis of factors which suggest that a group of communities should be treated as a unit for purpose of setting and implementing air quality standards. Factors to be considered include meteorological and topographical considerations, and jurisdictional boundaries, the extent of urban-industrial concentrations, and the nature and location of air pollution sources.

Atmospheric areas now defined were delineated mainly on the basis of meteorological data on the occurrence



ATMOSPHERIC AREAS OF THE UNITED STATES

(Section 107 (a) (1), Clean Air Act, as amended)

of thermal inversions (in which a layer of warm air above an area tends to keep pollutants from being dispersed) and on the speed and direction of winds. The location of major topographical features, such as the Rocky Mountains, was also taken into account.

On an annual basis, the characteristic mixing capacity of the air in each atmospheric area is different from that in adjoining areas, but the differences tend to diminish near the boundary lines between areas.

This means that the boundary lines represent zones of change, rather than sharp cutoff points, and that air, polluted or not, can and does flow from one atmospheric area to another. For these reasons some of the air quality control regions to be designated by the Secretary may include communities which are in different atmospheric areas.

The meteorological data used to define the atmospheric areas were derived principally from co-operative research conducted over the past several years by the National Centre for Air Pollution Control of the Public Health Service and the Environmental Services Administration of the Department of Commerce.

### Federal Support for Control Programmes

Under the Air Quality Act, 1967, the National Centre for Air Pollution Control, through its Control Agency Development Programme, is able to assist in the development, strengthening, and support of State, regional, and local air pollution control programmes by (1) providing grant-in-aid assistance and (2) providing technical assistance to official agencies conducting such control programmes.

An explanatory "fact sheet" has been issued by the Centre describing how, and under what conditions, assistance may be provided. Entitled "Air Pollution Control Program Support Under the Air Quality Act of 1967", it is available from the Centre at the Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C., 20201.

### Symposium on Air Quality Criteria

Under this title a two day conference was held in New York City on 4 and 5 June, organized by the Air Pollution Control Association, the American Industrial Hygiene Association, the American Petroleum Institute, the Industrial Medical Association, and the Occupational Health Institute.

The main headings for the subjects covered were carbon monoxide, oxidants, sulphur dioxide, inert particulates, and lead. We hope to be able to give a fuller account of the symposium at a later date, but we are informed that the formal papers and prepared discussions will be published in the September issue of the *Journal of Occupational Medicine*.

### APCA Conference

The 61st annual meeting of the Air Pollution Control Association will be held at St. Paul, Minnesota, on 23 to 27 June, 1968. The programme lists 36 sessions, with a total of 198 papers to be presented. The opening or keynote speaker at the first, plenary session, will be the Hon. Hubert H. Humphrey, U.S. Vice-President.

### Smog and Heredity

Dr. A. J. Haagen-Smit, Professor of Biology at the California Institute of Technology, who discovered the connection between Los Angeles smog and motor vehicle pollution, has recently said that there is a "distinct possibility" that air pollution in cities may affect the genes of people living in them, and may thus change the inherited characteristics they pass on to their descendants.

"The oxides of nitrogen in the form of nitrates react readily with amino groups to form alcohols", Dr. Haagen-Smit is reported to have said, "and the building materials of living organisms, the proteins and the nucleic acids, the carriers of genetic information, are all of these amino groups, and thus are subject to attack".

Recent studies had shown that oxides of nitrogen could and did cause mutations in viruses and phages, which were viruses that lived in bacteria, he said.

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*Japan*

## PUBLIC NUISANCE LAW

The Japanese Government passed a "Law on Basic Countermeasures to Public Nuisance" in August 1967. This Law, or Act as we would call it, has the purpose of integrating countermeasures on a national scale to what it terms "public nuisances". Public nuisances are defined as those things which have a detrimental effect on health and environment, on vegetation and on animal life. Air pollution, water pollution, offensive odours and noise are designated as public nuisances.

The responsibilities of the national government, local authorities, industry and private citizens are defined in general terms and the Government is required to report progress each year to the Diet. The Government is responsible for laying down environmental standards generally and for stipulating limits on emissions by industry, has the power to enforce systems of surveillance and measurement of pollutants, and is generally responsible for education and propaganda. Local authorities are required to implement these policies in the areas for which they are responsible.

In those areas where pollution is already a serious menace, or where it may become so, the Prime Minister himself is responsible for the formulation of a "Public Nuisance Prevention Plan" to be implemented by the Governor of the province or district concerned with the Prime Minister's approval. However, it is also laid down that the Prime Minister shall consult with the Governor of the Province concerned before formulating his plan; and before giving his approval to the Governor's action, the whole matter may be discussed at the Prevention of Public Nuisance Conference.

Industry is to bear either the whole or partial cost of the work of alleviating nuisances but there is also provision for national taxation to raise money to be spent by local authorities on this work.

*Australia*

### Call for Car Pollution Control

At its annual conference in November last the Australian Automobile Association, with 1.8m members, passed a resolution urging the Federal and State Governments to make compulsory the fitting of anti-pollution devices to all new vehicles with petrol engines. The resolution specified the fitting of positive crankcase ventilation systems on all new petrol engines after a stated date; the urgent development of devices to reduce exhaust gases from petrol engines; and the introduction of legislation aimed at controlling the smoke level of diesel emissions.

*U.S.S.R.*

### AFTERBURNERS FOR BUSES

Exhaust purifiers which double as silencers have been fitted to 200 buses in Alma Ata in the province of Kazakhstan in Southern Russia.

The equipment takes the form of a meshed cylinder filled with a catalyst, which promotes burning of unburned fuel in the exhaust. A compressor feeds fresh air to the exhaust, upstream from the catalyst, which aids the burning of carbon monoxide, nitric oxide and the other dangerous products of combustion. It is claimed that at 20-28 m.p.h. (30-40 k.p.h.) 90 per cent of carbon monoxide in the exhaust is removed. *Motor Transport*

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*Review*

## *Scorer on Air Pollution*

**Air Pollution, by Richard Scorer. Crown 8vo., pp. 151. Pergamon Press, Oxford, hard cover, 45s; flexiback, 30s. net.**

This book by the Professor of Theoretical Mechanics at Imperial College, is published in a series, "Commonwealth and International Library of Science, Technology, Engineering, and Liberal Studies". It is an unusual book on air pollution, and is notable for its profusion of photographs, about 100 in all, of which 60 are in colour. It is primarily a study of the meteorological aspects of air pollution—the behaviour of pollution in the atmosphere under a variety of conditions. In his preface the author points out the complexities of the problems of determining the behaviour of pollution in the air, and says that "the purpose of this book is to describe the basic mechanisms whereby pollution is transported and diffused in the atmosphere, to give practitioners a correct basis for their decisions".

He goes on: "So often have I met experts using formulae in situations to which they are not applicable that I may seem to give exaggerated emphasis to the complexities which make the formulae wrong, and too little advice of what to do instead. But the complexities are the essence of it, and make almost every situation unique, which is why we have so many pictures".

The contents of the book can be indicated by quoting the chapter headings: pollution over flat country; dilution: formulae and mechanisms; high level inversions; ground and valley inversions; wet and coloured plumes and natural pollution; separation; some effects of air pollution; repercussions.

The photographs are excellent and fascinating, and all but a dozen or so were taken by Professor Scorer. The text is largely built around the cases that are depicted by the illustrations, and together the discussion and the pictures make an illuminating survey of the subject. The chapter on "Some effects of air pollution" selects only a few aspects of the problem, discussed in a way that is likely to be provocative to many, with summary judgments where one would expect more argument and evidence, even though there is undoubtedly substance in some of the assertions.

Professor Scorer is one of the authors to present a paper at the NSCA conference at Harrogate in October. This will be in the session on industrial chimneys, and his printed paper will be illustrated by a selection of his photographs.

## Change at B.C.U.R.A.

The 1967 Annual Report of the British Coal Utilization Research Association begins with a note on its future. Discussion between the B.C.U.R.A. Council, the Ministry of Technology and the National Coal Board, with advice from the Ministry of Power, have led to a plan for which final approval is expected shortly. According to this plan, the N.C.B. will take over financial responsibility for B.C.U.R.A. on the 1st January, 1969, and run it as a wholly owned subsidiary company; financial support will also be provided by the Ministry of Technology over the first two years from then. The terms of reference will in general be similar to those at present, and it is hoped that industry will maintain contact by means of an arrangement of Associate Membership. B.C.U.R.A. will however seek to obtain a substantial contract income in such fields as coal utilization, chemical engineering processes, high-temperature technology, instruments, and materials handling.

The new Director General, Dr. L. C. F. Blackman, took office on 1st December and began immediately to recast the structure of senior staff and departments to meet the new situation. Mr. D. Hicks, the former Director General, retired on 30 September.

The income in 1967 was just over £650,000; the fall of £80,000 from 1966 was due mainly to the termination of the sponsored research on coal firing for M.H.D. power generation.

The Report, priced at 2 gns, may be obtained from Miss E. N. Rosling, M.B.E., Information Service, B.C.U.R.A., Randalls Road, Leatherhead, Surrey.

During the year increasing attention was given to identifying those projects that were likely to lead to early application of the results—a policy that will become dominant in 1968.

## Natural Gas Utilization

A Conference on this subject is being organized by The Institute of Fuel jointly with the Institut Français des Combustibles et de l'Energie, and the Institution of Gas Engineers. It will be held at Eastbourne on 24 to 27 September, next.

At the time of the conference, natural gas will be flowing in substantial quantities from the North Sea and it is intended that the papers presented shall give information on the latest developments in the use of natural gas in industry. Having in mind the considerable experience built up in the utilization of natural gas throughout the world, The Institute of Fuel has, in addition to papers from the United Kingdom, obtained papers from Austria, Canada, France, Germany, Holland, Italy, and the United States of America.

In view of the impact that natural gas will have on the industrial life of Britain, the conference will present an excellent opportunity for industry to make itself aware of both current practice and future possibilities.

For further information please apply to the Secretary of The Institute of Fuel, 18 Devonshire Street, Portland Place, London, W.1, England.

## Air Pollution from Engines

The Science Research Council have awarded a £4,500 contract to Loughborough University's department of transport technology for research into atmospheric pollution by vehicle petrol engines. This is one of a number of projects being carried out by a research team led by G. G. Lucas, lecturer in the department, into various aspects of engine performance.

The aim is eventually to design a petrol engine of good optimum performance, particularly in this case by reducing air pollution with minimum loss of power and efficiency and a minimum of special appendages.

*Review*

# POWER SYSTEMS FOR ELECTRIC VEHICLES

The National Centre for Air Pollution Control, the Polytechnic Institute of Brooklyn, and the Columbia University sponsored a Symposium on Power Systems for Electric Vehicles at Columbia University, U.S.A., for three days in April 1967. The purpose of the Symposium was to provide a co-ordinated review of current research into power systems for electric vehicles. The meetings had a two fold purpose; first, to define the present status of knowledge in this field, and second, to stimulate further research.

A very comprehensive report of the proceedings comprising some 323 pages has been published by the United States Department of Health Education and Welfare.

The Symposium was introduced by a blunt statement from Richard S. Morse of the Massachusetts Institute of Technology to the effect that the air pollution problem in the United States was more complex than was generally recognized, but the "gasoline automobile" of which there were now over 80m. in the U.S., was the principle contributor to the total pollution. Because of the number of vehicles in use, the introduction of new and advanced devices for the control of emission could at best reduce air pollution to a limited extent in the next decade. It was therefore essential to develop new types of vehicles that would operate without generating harmful emissions. The studies of the panel were therefore directed towards the consideration of new types of motive power which were technically and economically feasible.

For three days the Symposium considered these problems, starting with an examination of the alternatives to the petrol driven vehicle and consideration of the use of electric vehicles. Power sources from the conventional battery to electro-chemical power devices and fuel cells were comprehensively covered; and current research into electric vehicles themselves, their propulsion, control, and braking systems were dealt with exhaustively by a number of highly qualified speakers.

Although this was a Symposium held in the United States directed towards the problems of, and developments in that country, Europe and the United Kingdom were by no means forgotten. An important paper on European developments of Power Sources for Electric Vehicles was presented by Dr. M. Barak of the Chloride Electrical Storage Co. Ltd. of London. In this paper, Dr. Barak reviewed progress and research on this side of the Atlantic and showed that we were well up with the hunt. Dr. Barak will be presenting a similar paper at the Society's forthcoming Conference in Harrogate in October 1968, and judging by the paper he delivered at Columbia University, he has much of interest to offer us.

It is not easy to sum up all the findings of a Symposium such as this. It is clear that a number of problems still remain; but it is equally clear that these are being gradually overcome. One significant statement made by G. E. Evans of the Union Carbide Corporation of Parma, Ohio, when discussing the hydrogen-air fuel cell was "In comparison with the internal combustion powered vehicle, the hybrid hydrogen-air vehicle will produce no air pollution, will operate silently, will operate at comparable fuel cost, and will provide similar acceleration, speed, and range".

Is this a glimpse of the future?

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**Correction**

On page 117 of the Blackpool Conference Proceedings, Dr. J. H. Hudson of Dartford R.D. is reported as saying in the discussion on the paper by Mr. Hicks that "grains/cu.ft. could be the best guide to dust prevention". Dr. Hudson asks us to point out that in fact he said the opposite, namely, that "grains/cu.ft. cannot be the best guide . . ."

# *The Problems of Smoke Control*

### PAPER BY JOHN CHRISTIE, 1st CLASS M.O.T., H.N.C. (MECH.,) SENIOR SMOKE INSPECTOR, GLASGOW, AT THE ANNUAL CONFERENCE OF THE SCOTTISH DIVISION IN HAWICK, 23 and 24 MAY, 1968.

THOUGH smoke is only one of the contributing factors of air pollution, I would like to deal with it alone and talk to you about some of the problems involved in its control.

Many people assume that when smoke control is mentioned the subject is industrial smoke. This is just not the case. It was made abundantly clear in the Beaver Report that domestic smoke from the household fire is responsible for at least 50 per cent of air pollution. Since the smoke problem is basically split into two categories, domestic and industrial, I would like to make some observations on each.

Let us take the domestic side first. The household open type fire when burning bituminous coal can produce a considerable amount of smoke, and the fact that it is discharged into the atmosphere at a relatively low level aggravates the problem. Most local authorities are well aware of this condition and are inaugurating smoke control areas to combat this social evil.

Several factors must be taken into consideration before a smoke control programme is instigated, principally the development area policy and the prevailing winds. Generally speaking in the West of Scotland the prevailing winds are south westerly with an easterly wind in the winter months. By starting the smoke control areas in the south west, the winds travelling towards the town or city centre should be relatively free from pollution. The gradual build up of the initial area will free the centre and north of the city from much of the airborne pollution which previously existed. The basis of this system is to give the maximum number of people the benefit of the smoke control area at the very onset of the programme. Every effort must be made to educate the public to the evils of smoke pollution. In many cases it requires some dramatic incident which receives widespread publicity before the public realises the magnitude of the problem; the best examples being the disastrous London smog of 1952 and the more recent case in New York where this great city was practically brought to a standstill. The fact that air pollution cases are receiving more publicity from the Press and T.V., indicates a growing awareness of the general public to the pollution of the atmosphere.

When you have an area under a smoke control order you may think that the problem of smoke no longer exists there. Unfortunately, speaking from experience, this is not always the case. The vast majority of the general public have accepted smoke control areas as a vital amenity. A few do not like legislation in any form while another small percentage sit on the fence to see how the Local Authorities will react to the defaulters. In my opinion, it is imperative that the smoke control areas be given constant supervision. If you want the general public to back your Clean Air Programme, the smoke control areas must be seen to work.

One of the biggest problems in Glasgow has been the indiscriminate sale of bituminous coal in the Areas. This retailing of coal by coal merchants became so widespread that the Corporation of Glasgow sought Parliamentary powers to stop this practice. After discussion with the National

Coal Board and the Coal Merchants' Association a compromise was reached. In this new arrangement the merchant, when he signed his coal contract with the N.C.B., agreed that he would no longer sell coal in Smoke Control areas and should he contravene this agreement his supplies would be liable to be stopped. I regret to say that this agreement has had little effect on these "pirate" merchants. In fact, I have come to the conclusion that we would have had more success if we had hired the Salvation Army band to follow these merchants round the areas, playing "Yield not to temptation".

The actions of these coalmen are doing untold harm to the Clean Air programme and bringing nothing but discredit to their trade as a whole. To date more than 70 coal lorries have been reported by my department to their Association. Some of these have been reported on more than one occasion for selling coal in a smoke control area. Frequently it was necessary for my Inspectors to work a considerable amount of overtime to obtain evidence against these defaulters. Since November, 1966, when the agreement started, not one merchant has had his supply of coal stopped. I feel that if the Coal Merchants' Association had acted immediately against these defaulters, this agreement would have worked. Since no apparent action has been taken against the men supplying this coal, more and more merchants are carrying unauthorized fuel.

I am pleased to see that the new Clean Air Bill has incorporated a section to deal with this problem.

**Prosecutions**

With regard to the tenants found to be burning coal in smoke control areas, we have found from experience that, unless these culprits are prosecuted, the conditions in that area will deteriorate. There is no satisfaction in prosecuting people, but the minority must not be allowed to jeopardize progress. During the year 1967, 308 prosecutions were taken against tenants burning coal in smoke control areas. In addition to this, nearly 600 warning letters were sent out. The majority of these letters went to Old Age Pensioners living on limited incomes who were understandably having a hard time making ends meet. We are extremely loathe to take action against the old folk and consequently the Inspectors try to help them understand the best means with which to burn their smokeless fuel efficiently. The Corporation of Glasgow raised the problem of the Old Age Pensioners in smoke control areas with the Ministry of Social Security in an effort to increase the supplementary pension over the winter months to help with the increased fuel bill. This, unfortunately, met with no success.

The Clean Air Council took up this cause and has achieved some success. After several meetings with the Director of the Ministry of Social Security, it was agreed that if the local Social Security Inspector found that old age pensioners were suffering hardships due to the cost of solid smokeless fuels he would review the matter.

For those of us involved in smoke control the steady rise in price of solid smokeless fuels is causing grave concern. In 1960 the cost of the cheapest solid smokeless fuel was approximately the same as grade 2 coal. Over the years the differential between them has increased steadily until it now amounts to roughly 3s. per cwt.

While it is understood that processing and fuel costs have risen, I would remind the Solid Smokeless Fuels Federation that if they cannot keep the price of their fuel within the means of the working man, they will undoubtedly encourage tenants in new areas to convert to gas or electricity.

It is essential for the health and wellbeing of the community as a whole that local authorities actively pursue their clean air programme. The Public must realize that they have a vital part to play if we are to achieve any success in the reduction of air pollution. There is a great deal of truth in the old saying, "mony's a mickle mak's a muckle".

## Industrial Premises

So much for the domestic side of the problem, but what about industrial premises. The public in general do not realize what a complex and varied field comes under the heading of industrial premises. It can range from the giant steel and chemical manufacturers to the small workshop. When it comes to the combustion and dispersal of gases in industry, no two problems are alike, consequently each must be dealt with on its own. Many of the problems involving smoke can be quickly dealt with by the simple matter of a change of fuel. However, there are also the cases where a major conversion is required entailing considerable expenditure. Naturally, in a case like this a great deal of consultation has to take place between my own section and the Works Management. Generally speaking, when the conversion in question is obviously going to increase the efficiency of the steam generation, there is little opposition, but if our requirements are such that the ancillary plant will show no profit, then a great deal of persuasion or pressure may be necessary.

In many cases these major conversions require several days with the plant shut down. It is, therefore, reasonable to allow them the opportunity of carrying out this work during a holiday period, providing they use the "best practicable means" to minimize any existing excessive smoke emissions. This term "the best practicable means" crops up frequently in the Act and raises the question of the qualifications and experience of the Inspectors.

Since it may be necessary to show that an offence has been caused through negligence, the experience of an Inspector who is familiar with the combustion processes and techniques is invaluable.

Since the Industrial Revolution there has been a fundamental change in the air we breathe. In the early days both fuel and labour were cheap—consequently nobody bothered about the efficiency of the unit. Today, neither labour nor fuel is cheap. This has had the effect of making management more efficiency conscious, and this is a most desirable condition in the campaign for clean air, for the efficiency of combustion is synonymous with smoke abatement. Because of this, the subject of the efficiency of combustion warrants further comment. From the point of view of those of us concerned with clean air, it should always be remembered that if heat is being wasted, then more fuel is being burned than is necessary, which means in turn an increase in air pollution.

We are rapidly approaching the time when changing conditions will automatically tend to bring about a reduction in atmospheric pollution.

Smoke emissions from industry have been reducing steadily in the last 10 years. It is now estimated that smoke attributed to industrial plant has been reduced by 50 per cent since 1956. The practice of fuel efficiency has made great strides in the past 15 years. Increased costs, which the industrialist has had to face, together with the national fuel efficiency propaganda, is now starting to show results. Many managements, presumably through lack of technical knowledge, do not devote much attention to the fuel consumption of the factory. While it is not suggested that they become fuel technologists overnight, they should demand from their technical staff, an account of the use, or misuse, of the fuel. By so doing, they will find that any lethargy which there may have been in the operation of the boiler house, will rapidly diminish, with the resultant desired effect of reducing fuel wastage. Too many Boards of Directors, have for too long regarded the boiler house as "that dirty place" where they make steam. Many of them seem to forget that their whole production is geared to the process and space heating steam generated from that so called "dirty place".

It is generally true that firms using large quantities of steam will employ technical staff to handle the combustion problems. The worst offenders are the smaller firms. These establishments will rely on the management and perhaps an engineer, whose duties will cover a wide field throughout the factory.

It is, however, clear that, with little effort and a small expenditure, the smaller firms could help themselves. They can also obtain invaluable assistance from the fuel efficiency services, the most notable of which is National Industrial Fuel Efficiency Service. The technical staff of these concerns are well qualified to ascertain the manner in which the boiler plant efficiency could be increased.

### Maintenance and Instrumentation

Most of the smoke emissions and needless waste of fuel could be eliminated by simple maintenance of plant. The forcing of a boiler above its economic burning rate will undoubtedly give rise to the emission of dense smoke. Here is a case where the boiler plant is not of a sufficient capacity to cope with the factory demands and obviously needs to be augmented. The money saved by the elimination of smoke with this additional plant will in time pay for the new installation. It is amazing the number of small plants, which through lack of supervision and maintenance, are working uneconomically. Badly fitting doors, steam leaks and unlagged pipes and boilers, contribute in no small way to the cost of running plant—yet, in so many instances they are not remedied.

This brings me to the instrumentation of the boiler plant. The Law demands that the boiler plant should have certain mountings and fittings. All the plants have minimum requirements—but many of them have little else. You would not drive a motor car without a petrol gauge or a speedometer—these are the means of making the unknown, known. The same applies to boiler operation. With the use of $CO_2$ recorders, draught gauges, etc., a fireman can control to fairly fine limits the combustion of a furnace. Now I will be the first to admit that elaborate equipment and instruments do not guarantee smokeless combustion, but they certainly make it more likely.

So much for the theoretical side of the problem, but what about the practical everyday issues which arise? The pollution from industry can be broken down into roughly three groups—smoke, grit and fumes. As my time is limited I only intend to deal with smoke.

What is smoke? It is the tarry hydrocarbons which have been distilled from the fuel passing unconsumed through the furnace to atmosphere. The worst offenders are by far the hand fired boilers. With many of the lower grade fuels, it is extremely difficult to avoid making smoke at times and in the hands of a stoker, who has a limited knowledge of the principles of combustion, the result can be disastrous with regard to the emission of smoke.

To offset the human error, there is a general trend in industry to convert boilers from hand firing to mechanical firing. This has been found to raise the overall efficiency of the plant.

You may ask, "what are the benefits of a mechanical stoker, apart from the reduction in manual labour entailed? First of all, you must understand the essentials for good combustion—high furnace temperature, adequate air supply and a good mixing of the gases together with an adequate combustion space.

Let us look how the first of the conditions, high furnace temperature, is affected in hand fired boilers.

In order to fire the boiler the stoker must open the furnace door. In doing so he allows a large ingress of cold air thus reducing the furnace temperature. He then shovels fuel on to the grate, which if not carried out in the approved manner can further reduce the furnace temperature. This reduction in temperature allows the gases, which would normally have ignited and given off heat, to pass through the furnace unconsumed. The ideal method is, of course, a little fuel often rather than a great deal at lengthy intervals. The former entails frequent opening of the furnace door with the consequent large inrush of cold air, whereas the latter blankets the fire and chills the furnace.

### Mechanical Stoking

The mechanical stoker can supply a steady feed of coal without any opening of doors, and with forced draught can be quickly controlled to suit requirements. Therefore, two of the essential needs are satisfied, namely high furnace temperature and adequate air supply. There are several types of mechanical stokers now in use—coking, chain grate and underfeed being the most common.

The latter, which is very popular in central heating plants, is the most common type in use and I wish to talk about it in particular. The operation of this type of stoker is simple and effective though there are some problems with its use in smoke control areas. The underfeed stoker operates most effectively when it is running continuously. The fitting of modulating control, which automatically varies the feed of the fuel and air supply to suit the loading, achieves this end. Unfortunately, these modulated control stokers are in the minority. The majority of the stokers work on the simple cut off and on principle, which means that during the stop period the fuel which is already in the furnace is starved of air and consequently smokes. It is my contention that in many cases the stokers are not operating, as quoted from the Clean Air Act, "as far as practicable smokelessly" since the word "practicable" is defined in the Act as having regard to the current state of technical knowledge.

This problem of overcoming the smoke periods when the main unit has cut out can be minimized by the installation of supplementary air jets to operate during this period. With the use of highly bituminous fuel it is absolutely clear that this stoker cannot conform to the requirements of a smoke control area without some provision being made to remedy this smoky period when the mechanical stoker is stopped. Despite all this, the mechancial stoker for solid fuels has contributed greatly towards the reduction in smoke with the proviso that proper fuel is used together with good maintenance and operation.

### Oil

The present trend in industry is to convert from solid fuel to oil fuel firing. Some people seem to think that you never have any smoke with oil fuel. This, of course, is nonsense. The best example I can think of at this moment is the smoke screen used by the Navy during the war. This was achieved by causing incomplete combustion of oil, i.e. lowering the temperature of oil or reducing air supply. Many of the oil fuel units are only looked at once a year and they wonder why it is not working properly.

However, the use of oil fuel has made an appreciable reduction in the emission of smoke from industry. Unfortunately, it has also brought with it the problem of an increase in $SO_2$ being discharged to atmosphere. From the point of view of economics the Industrialist uses the heavy residual oils—3,500 seconds Redwood with a sulphur content of up to 4 per cent. As it is not an economic proposition to remove the sulphur in the oil, we must turn our attention to means by which the gases are discharged to atmosphere—namely the chimney.

### Chimneys

The purpose of a chimney is to disperse the gases at a height which will allow them to dissipate without causing annoyance in the area. The ultimate objective is, of course, to solve industrial combustion problems by prevention rather than rely on dispersal of gases. A great deal of research is being carried out by the oil burner manufacturers and the oil companies to achieve this end.

Section 10 of the Clean Air Act

relates to heights of chimneys and the provisions of this section deal with proposals or plans to erect new chimneys connected with a plant.

It is to be regretted that this section does not cover existing chimneys. This in my opinion is a glaring weakness in the Act which is causing the local authorities quite a bit of trouble. The position at the moment is such that industrial premises can install additional boiler plant, thereby increasing the volume of gases discharged to atmosphere, and yet still use an existing chimney. Where this chimney is of an adequate height to disperse the gases there is obviously no problem, but in the majority of cases it is quite the reverse. Of course, when the plant is operating with a low chimney and the fumes emitted are causing annoyance, action can be taken against the operators of this boiler plant under the appropriate section of the Public Health (Scotland) Act, 1897. The Local Authorities are in the invidious position of having to stand by and watch this situation arise. Surely the time to act is not after the offence has occurred, but beforehand, to prevent such an occurrence. Until this section 10 is amended to include existing chimneys, we must rely on our powers of persuasion to make the owner of the boiler plant see reason.

It may well be that a conflict of interests will arise between the designers who are anxious to preserve the external lines of new buildings and the local authorities who may be anxious to raise the discharge of the flue gases. In many cases a compromise is agreed upon to strike a balance between preserving the looks of the area and preventing the pollution of the atmosphere in the neighbourhood. You could say it was a marriage of the possible with the practicable.

You may think from my remarks that the industrialist requires a great deal of prodding to get some action. In all fairness, I must say that generally speaking they have been very co-operative. In Glasgow we endeavour to assist in any way we can to eliminate smoke problems rather than take punitive action. The cases we have taken to Court we look on as having been a failure on our part to impress on the parties concerned that the prevailing conditions were not satisfactory.

Industrialists must realize that they are morally obliged to consider the health and wellbeing of the inhabitants in their area. Nobody will deny that the industrialist has a difficult job in many cases making ends meet and also complying with the Clean Air Act.

By all means let us sympathize with him and give him every assistance in his problem but we must always remember that our first allegiance lies with the campaign for clean air.

## DUSSELDORF AGAIN

The Society sponsored a successful Joint Venture Stand at the Dusseldorf Clean Air Congress and Exhibition in 1964, in which a number of British firms and organizations participated. The Society is now organizing a similar Joint Venture Stand for the 2nd Clean Air Congress and Exhibition in Dusseldorf from 13 to 17 October, 1969.

The Stand is being organized in co-operation with the Board of Trade, and will provide an opportunity for firms to exhibit clean air equipment on the Continent on very favourable terms. Preliminary inquiries from members and friends of the Society should be addressed to the Assistant Secretary, NSCA., Alan Mister.

**"Patterns of urbanization"** is the subject to be studied by a working group of researchers recently formed by the Centre for Environmental Studies. The Centre was set up recently with funds from the Ford Foundation and the U.K. Government to promote research into problems of the planning and design of the physical environment. Further information about the Centre and its programme may be obtained from 5 Cambridge Terrace, Regent's Park, London, N.W.1.

# SMOKE CONTROL AREAS

## Progress Report

### Position at 31 March 1968—TOTALS

| | England | Wales | Scotland | Northern Ireland |
|---|---|---|---|---|
| **Smokeless Zones** (Local (Acts) in Operation | 44 | — | 1 | — |
| *Acres*, 3,400 | | | | |
| *Premises*, 41,060 | | | | |
| **Smoke Control Areas in Operation** | 2,394 | 6 | 103 | 1 |
| *Acres* | 597,129 | 418 | 43,297 | 380 |
| *Premises* | 3,190,336 | 2,352 | 269,955 | 4,417 |
| **Smoke Control Orders** | | | | |
| *Confirmed* | 323 | — | 25 | 5 |
| *Submitted* | 71 | 1 | 7 | 7 |
| **Grand Totals** | 2,832 | 7 | 136 | 13 |

### Summary of Progress (England) at 31 March 1968

| (1) *Region* | (2) *No. of black area acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage* of total black area acreage in region so covered* | (4) *No. of black area premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage* of total black area premises in the region* |
|---|---|---|---|---|
| Northern | 24,183 | 19·30 | 117,751 | 21·29 |
| Yorkshire and Humberside | 134,994 | 35·85 | 459,953 | 39·38 |
| East Midlands | 43,241 | 14·75 | 142,779 | 27·89 |
| Greater London | 201,485 | 61·61 | 1,794,268 | 67·98 |
| North Western | 138,725 | 34·58 | 634,252 | 37·25 |
| West Midlands | 72,467 | 29·10 | 319,246 | 30·36 |
| South Western | 7,201 | 27·33 | 26,650 | 17·89 |
| Totals (black areas) | 622,296 | 35·08 | 3,494,899 | 44·95 |
| Outside black areas (all parts) | 109,464 | | 373,639 | |
| GRAND TOTALS | 731,760 | | 3,868,538 | |

* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country).

# NEW SMOKE CONTROL ORDERS

*The lists below are supplementary to the information in the last issue of "Smokeless Air" (Spring 1968) which gave the position up to 1 January, 1968. They now show changes and additions up to 1 April, 1968.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.*

## ENGLAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

**Northern**

*Teeside*

Billingham U.D. No. 5.

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*

Newcastle upon Tyne C.B. No. 12. Tynemouth C.B. No. 7. Whickham U.D. Nos. 5, 6 and 7.

*Teeside*

Billingham U.D. No. 6. Hartlepool C.B. Nos. 11 and 12. Middlesbrough C.B. (The Avenue, Keith Regent and Sutton).

**Yorkshire**

*West Riding (North)*

Baildon U.D. No. 10. Bradford C.B. (Listerhills). Brighouse B. No. 13. Heckmondwike U.D. No. 7. Horsforth U.D. No. 26. Leeds C.B. No. 68. Mirfield U.D. No. 9. Shipley U.D. No. 9. Sowerby Bridge U.D. Nos. 5 and 6. Spenborough B. No. 9. Stanley (Yorks) U.D. No. 2.

*West Riding (South)*

Barnsley C.B. No. 4. Conisbrough U.D. No. 1. Dearne U.D. (Thurnscoe No. 2). Mexborough U.D. No. 1A. Sheffield C.B. Nos. 23 and 26.

**North Western**

*South Lancashire and North-East Cheshire*

Atherton U.D. No. 4. Chadderton U.D. Nos. 10 and 11. Dukinfield B. No. 14. Failsworth U.D. No. 7. Golborne U.D. No. 1. Hyde B. No. 5. Irlam U.D. (Irlam No. 3). Oldham C.B. No. 15. Royton U.D. No. 4. Stalybridge B. (Copley, Millbrook, Carrbrook and Harridge). Stretford B. No. 12. *Tottington U.D. No. 1. Wigan C.B. No. 4. Worsley U.D. No. 5.

*Central Lancashire*

Colne B. No. 6. Darwen B. No. 3A.

*Merseyside*

Birkenhead C.B. No. 6. Runcorn R.D. No. 2A. *St. Helens C.B. No. 5A. Wallasey C.B. No. 13. Widnes B. Nos. 8 and 9.

**Midlands**

*Derby, Nottingham and Chesterfield*

Beeston and Stapleford U.D. No. 9 (parts of Beeston, Bramcote and Chilwell). Chesterfield B. No. 5. Chesterfield R.D. No. 10. *Mansfield Woodhouse U.D. No. 1.

*North Midlands*

Leicester C.B. Nos. 19-24.

*West Midlands*

Aldridge-Brownhills U.D. No. 27A. Birmingham C.B. Nos. 149 and 151. *Halesowen B. No. 9. Halesowen B. No. 28. Solihull C.B. Nos. 14 and 15. Stourbridge B. Nos. 26 and 27. Sutton Coldfield B. No. 10. West Bromwich C.B. No. 17.

*Potteries*

Kidsgrove U.D. (Spout Hollow No. 2). Kidsgrove U.D. (Gillbank No. 2). Stoke-on-Trent C.B. No. 17.

**London**

*Greater London Boroughs*

Barnet L.B. No. 7. Bexley L.B. No. 8. Camden L.B. (Hampstead Nos. 11 and 12). Camden L.B. (St. Pancras No. 9). Ealing L.B. No. 35. Enfield L.B. No. 16. Harrow L.B. No. 16. Havering L.B. No. 4. Hillingdon L.B. No. 9. Hounslow L.B. (Brentford and Chiswick No. 9). Hounslow L.B. (Heston and Isleworth No. 12). Hounslow L.B. (Heston and Isleworth No. 37). Hounslow L.B. (Feltham No. 8). Merton L.B. No. 8. Newham L.B. No. 5. Richmond-upon-Thames L.B. (Twickenham No. 7). Richmond-upon-Thames L.B. (Richmond No. 9). Southwark L.B. Nos. 23 and 24. Sutton L.B. Nos. 17 and 18. Waltham Forest L.B. No. 13. Wandsworth L.B. No. 2.

*Outer London*

Dartford R.D. Swanley (West). Dartford R.D. (The Bean).

**Local Authorities Outside the Black Areas**

Blaby R.D. Glen Parva No. 4. *Crewe B. No. 4. High Wycombe B. No. 15. Luton C.B. No. 6. Old Fletton U.D. (Stanground No. 6). Old Fletton U.D. (Woodston No. 7). Scunthorpe B. No. 7. Skelmersdale U.D. No. 3. Skipton U.D. No. 5. Staines U.D. No. 9. Stokesley R.D. (Hemlington Park). Tamworth B. No. 1. Whitley Bay B. No. 4. Wilmslow U.D. No. 12.

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Teeside*

Darlington C.B. (Lascelles Park). Darlington C.B. (Redhall).

**Yorkshire**

*West Riding (North)*

Aireborough U.D. No. 23. Bingley U.D. No. 14. Keighley B. No. 7. Knottingley U.D. (Hill Top). Knottingley U.D. (Wentcliffe Hill). Leeds C.B. Nos. 71 and 72.

*West Riding (South)*

Barnsley C.B. Nos. 5 and 6. Doncaster C.B. No. 10.

**North Western**

*South Lancashire and North-East Cheshire*

Eccles B. No. 8B. Eccles B. No. 9. Leigh B. No. 8. Salford C.B. No. 16. Whitefield U.D. No. 9. Worsley U.D. No. 6.

*Central Lancashire*

Accrington B. No. 8. Fulwood U.D. No. 2. Rishton U.D. No. 1.

*Merseyside*

Huyton-with-Roby U.D. No. 5. Runcorn U.D. No. 4.

**Midlands**

*Derby, Nottingham and Chesterfield*

Carlton U.D. Nos. 3 and 4. Derby C.B. No. 14. Dronfield U.D. No. 4. Mansfield B. No. 5.

*West Midlands*

Bedworth U.D. No. 2. Birmingham C.B. No. 130. Dudley C.B. Nos. 52-54. Nuneaton B. No. 5. Sutton Coldfield B. No. 11. Walsall C.B. No. 13.

*Potteries*

Stoke-on-Trent C.B. No. 21.

**London**

*Greater London Boroughs*

Bromley L.B. Nos. 7, 8 and 9. Croydon L.B. No. 10. Ealing L.B. Nos. 36 and 37. Harringey L.B. (Tottenham No. 8). Harringey L.B. (Hornsey No. 10). Harrow L.B. No. 17. Hillingdon L.B. No. 10. Merton L.B. Nos. 9 and 10.

*Outer London*

Dartford B. No. 7.

**Local Authorities Outside the Black Areas**

Basildon U.D. No. 7. Belper R.D. No. 1. Crawley U.D. (Northgate). Rugby B. No. 9. Southampton C.B. No. 7. Whiston R.D. (Knowsley No. 1).

## SCOTLAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

Falkirk No. 6.

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Clackmannan County (Tullibody). Coatbridge (Greenhill and Langloan). Denny and Dunipace (No. 1). Falkirk No. 7. Galashiels (High Road and Balmoral) Grangemouth (Newlands). Paisley (Hunterhill).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Alloa (No. 1). Coatbridge (Greenend; Barrofield). Lanark County (Bankhead; Blantyre West).

## WALES

### NEW SMOKE CONTROL ORDER SUBMITTED BUT NOT YET CONFIRMED

Wrexham B.C. No. 3.

## NORTHERN IRELAND

### NEW SMOKE CONTROL ORDER IN OPERATION

Castlereagh R.D. No. 1.

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Belfast C.B. No. 1. Castlereagh R.D. No. 2. Hillsborough R.D. No. 1. Holywood U.D. Nos. 1 and 2.

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Antrim R.D. No. 1. Craigavon No. 1. Lurgan B.C. No. 1. Newtownabbey U.D. Nos. 1 and 2. Portadown B.C. Nos. 1 and 2.

# GRIT AND DUST

## *With particular reference to the Working Party Report*[*]

*by*

**J. Beighton**
*B.Sc., F.R.I.C., A.M.I.Chem.E., M.Inst.F.*
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THE Clean Air Act of 1956 has now been in force for over ten years and has made its impact on both industry and the domestic scene. We have all become much more aware of the case for clean air and we are integrating it into matters of planning and development and the daily issues affecting our living as a community.

The Clean Air Act deals essentially with smoke, grit and dust from combustion processes and from whichever standpoint the argument for clean air is assessed the necessity to control such emissions is clear. The Clean Air Act was a tremendous step forward but, in itself, it is not perfect nor complete. The Clean Air Bill at present in Parliamentary process is designed to rectify at least some of the imperfections. The 1956 Act left a number of things to be decided on how certain provisions were to be implemented and complied with. This is not unreasonable for all the answers could not have been expected in 1956 and time and experience have been needed to appreciate the practical application of the legislation. Some may feel that progress in clear air has not been fast enough but I suggest that to try to demand too much too soon could easily have alienated goodwill and co-operation which are needed if effective control is to be achieved.

The 1956 Clean Air Act contained a standard for smoke emission, i.e. qualifying dark smoke in terms of Ringelmann number, but it did not give such guidance on grit and dust. Sections 5 and 6 of this Act refer to requirements of minimizing grit and dust and to the fitting of arrestment plant. Section 7 gives the Minister powers to make Regulations on requirements for making and recording measurements of grit and dust from furnaces. Obviously the aim of sections 5, 6 and 7 is to try and obtain practicable minimums of grit and dust emissions, and it is useful to consider the following factors which can arise to qualify the position.

1. The most direct and effective way to look after an environment is to check and control the sources of emission.
2. An emission is influenced by the size and type of an installation and the type of fuel it is using.
3. The emission will be influenced by the design, character and maintenance and efficiency of use of the equipment.
4. Even when operated and maintained to best practicable standards, certain fuel using installations require arrestment equipment if public health and amenity are to be safeguarded.
5. Measurements are a means to an end and should never really be more elaborate than to give information sufficiently accurate to achieve that end with fairness and safety.
6. In making measurements of emission one implies that one has or hopes to get a yardstick by which they can be assessed.
7. Overall there is a need to consider

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[*] Address to the S.E. Division, NSCA, at the Caxton Hall, London, 28 February, 1968.

the elements of best practicable means in a given situation, i.e. technical and economic aspects, etc., and, again, to consider these in relation to the desired end point.

Appreciating the need for more information of grit and dust, the Ministry of Housing and Local Government, after due consideration, set up in 1964 a working party on grit and dust emissions whose terms of reference were

[*Terms of reference quoted here from actual working party Report*.]

As you know, the Report of the working party was published in 1967 and based on this Report and also published in 1967 is the Memorandum on Grit and Dust issued by M.H.L.G./Scottish Development Department/Welsh Office. No doubt copies have been seen and studied. Mention should also be made of the Circular (52/67 M.H.L.G., 23/67 Welsh Office) which accompanied the Memorandum since it contains useful points. This Circular referred to the Minister's intention shortly to make Regulations under section 7, Clean Air Act, about requirements on grit and dust. These Regulations are in a very advanced state of preparation and it is understood that they will be available soon but at present they are not yet published. The Regulations, in effect, will give "teeth" to the working party Report and the Grit and Dust Memorandum since actual requirements of measurements will be laid down.

Let us now briefly examine items of the working party Report and the Memorandum and perhaps appreciate some of the thinking behind them.

[*Paragraph 4, page 5, and paragraph 11, page 16, of the working party Report quoted here as being thought particularly important*.]

1. The furnace scope covers solid fuel fired boilers, oil fired boilers, solid fuel fired furnaces and oil fired furnaces in which furnace gases do not come into contact with the stock. Corresponding furnaces where the furnace gases do come into contact with the stock but where the latter does not contribute to emissions. Also, corresponding furnaces where the furnace gases do come into contact with the stock and where the stock does contribute to emissions.

2. Grit is defined as greater than 200 B.S. mesh, i.e. 75 microns. Dust is defined as less than 75 microns.

3. The working party had to examine existing methods and data and any standards relating. They were faced with a great shortage of data on emissions and tribute has been paid by the working party to the help given here by N.I.F.E.S. and the Oil Companies and their collaborators in providing information.

4. It is indicated that the measurement of grit and dust is not easy and should not be undertaken lightly or indiscriminately. Time, trained personnel, special equipment and site facilities are needed. It is explained that it is not intended that all plants should be tested but only those causing complaint and excessive pollution. Also, before deciding to test, checks should be made to see that the plant installed is being properly maintained and used since here there may be scope such as to render testing unnecessary. This preliminary appraisal is very important since a lot can sometimes be done. Some cases may involve real hardship and genuine difficulty if arrestment equipment is asked for and other alternatives may have to be sought.

5. The working party assumes that for new plant chimney heights and gas efflux velocities would be as recommended in the Chimney Memorandum. Also, they feel that emissions during periods of soot blowing and also problems of acid soot should be excluded from interpretation of the limits given since these are particular aspects which require special attention.

6. The working party have explained the general basis of test, the choice of sampling position and the sampling method. Not unnaturally, they have felt it preferable for the same method to be used by all. They have recommended the cyclone probe method

developed by BCURA and the Report and the Ministry Memorandum give reference on where to find details of the method. This apparatus is described in BS3405 but the sampling procedure recommended by the working party differs somewhat in detail from that given in BS3405. I understand that in the forthcoming Regulations on Grit and Dust it is proposed to allow the use of apparatus also mentioned in BS3405 as an alternative to the BCURA probe but it is understood that it is also proposed in the Regulations to ask for the use of the test procedure recommended by the working party.

7. The recommended method lends itself to a sampling period of 1 to 1½ hours and considers an accuracy of plus or minus 20 per cent to be sufficient. The method may be used for total solids or just grit and dust. It is suggested that the filter after the probe is only necessary in certain cases but the filter must be used when sampling oil fired equipment, employing silica wool in the filter. The working party Report also mentions a method by B.P. Research Centre which appears to be a suitable alternative on oil firing and perhaps more convenient in some cases. The method recommended by the working party measures the average emission over a period of sampling. If gas flows rate is not sufficiently steady then procedure has to be modified somewhat as detailed in the literature. The method appreciates the variation in the dust burden across a flue and the variation of plant working over a shift period. The recommended drill is to collect samples at four points in the cross section of the flue. Flue gas velocities are measured at the sampling point beforehand by pitot tube which is used as a test reference to get isokinetic sampling. The period of sampling should embrace "normal" conditions, i.e. allow for peaks and average pattern. It is envisaged that at least two or three tests over about eight hours should be taken on one visit and that a repeat survey within a week or two may often be advisable. The working party Report advises on choice and arrangement of access to the flue for sampling, i.e. to avoid disturbances from bends, to achieve gas flow substantially parallel to the flue axis, to obtain adequate flue gas velocity and to allow for any settling or arrestment taking place. It is said that sampling should preferably be in the chimney or as near as possible to it.

8. The working party Report recommends maximum levels of emission of grit and dust. It is clear that the working party were faced with problems in deciding both the quantities of emission and to what basis these should be referred. They have tried to keep the approach simple and workmanlike and to leave this to be assessed in the light of experience. They have realized that to use the basis of quantity of fuel consumed or to use a standard of dust concentration per cubic foot would require the obtaining of quite a lot of information which might not be easily available. Thus for boilers the working party decided on a simple basis to refer to maximum continuous rating of plant (MCR) and for a given MCR (i.e. steam pounds per hour) to state admissible maximum grit and dust emissions, pounds per hour, i.e. emission in a period of normal operation. Thus grit and dust figures were obtained as follows. Steam/fuel ratios were taken from experience for the size range of boilers in view, hence a range of MCRs was equated to a range of fuel consumption. Then the maximum amounts of grit and dust to be emitted were expressed as percentage of the fuel burned, these percentages based on good practice. In this way by relating back, grit and dust figures were equated to MCR. For furnaces the working party could not use the MCR basis but instead had to consider heat input. In this way they felt able to report recommended maximum emissions for furnaces where the stock does not contribute to the emission but where stock does contribute the working party felt that the position was too complex and the

available data too limited for figures to be provided. Instead they recommended that a study of such furnaces be made and this study has already started with the help of NIFES. The working party Report, however, does give a broad classification on such furnaces as an indication of the programme to be tackled.

The Grit and Dust Memorandum and the working party Report give a sample calculation for a test on boiler plants,

To the working party's credit they did not, in their Report, regard the picture as complete. They have endeavoured to offer good working levels which should be obtainable from normal plant properly designed, maintained and operated. They have left scope for review in the light of experience,

> [*Paragraph 10, page 15, of working party Report quoted here.*]

and have pointed out in their Report a number of things which should, in their view, receive attention and further consideration.

This Report, together with the Grit and Dust Memorandum and the Ministry Circular underline the need for a careful, commonsense, practical approach with reasonable "give and take" on all sides. These publications together with the Regulations, which I understand should be available soon, should, I feel, be of great help to us all.

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*Letters*

## SMOKE CONTROL IN HAMMERSMITH

*The Editor*
*Smokeless Air*

Sir,

I was extremely interested to see in your last issue the references to the completion of the Smoke Control Programme by my Council, but unfortunately the asterisk reference on page 196 might give the wrong impression.

The temporary suspension order recently confirmed by the Minister refers only to a block of 72 flats owned by the Greater London Council where a case was made out that it would be more appropriate to carry out the necessary grate conversions etc. to conform to the Clean Air Act as part of a completely modernizing programme being undertaken during the next two years, and not to the suspension of one of the orders involving many thousands of premises which are in operation.

Yours, etc.,
G. W. Herrick,
Chief Public Health Inspector,
*Hammersmith.*

## IS IT WORTH IT?

*The Editor*

Sir,

I have today been re-reading the correspondence, in your Spring 1968 edition, from the Medical Officer of Health, Blackburn, relating the trivial fines imposed for offences in Smoke Control Areas. Perhaps he may care to take heart from the fact that not all local Magistrates are so lenient with offenders and that the required deterrent is forthcoming on occasion.

In two cases before the local Magistrates this week, offences were proved and a fine of £10 in each case was made. These were the first cases taken in this area in respect of an Order operative less than two years. When one obtains judicial support in this manner it gives answer to Dr. Ardley's final query of "Is it worth it?"

Yours, etc.,
R. Goucher,
Chief Public Health Inspector
*Town Hall, Mold.*

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**Gas Changes Address**

From 6 May, 1968, the address of the Gas Council is 59 Bryanston Street, Marble Arch, London, W.1.

# NEWS FROM THE DIVISIONS

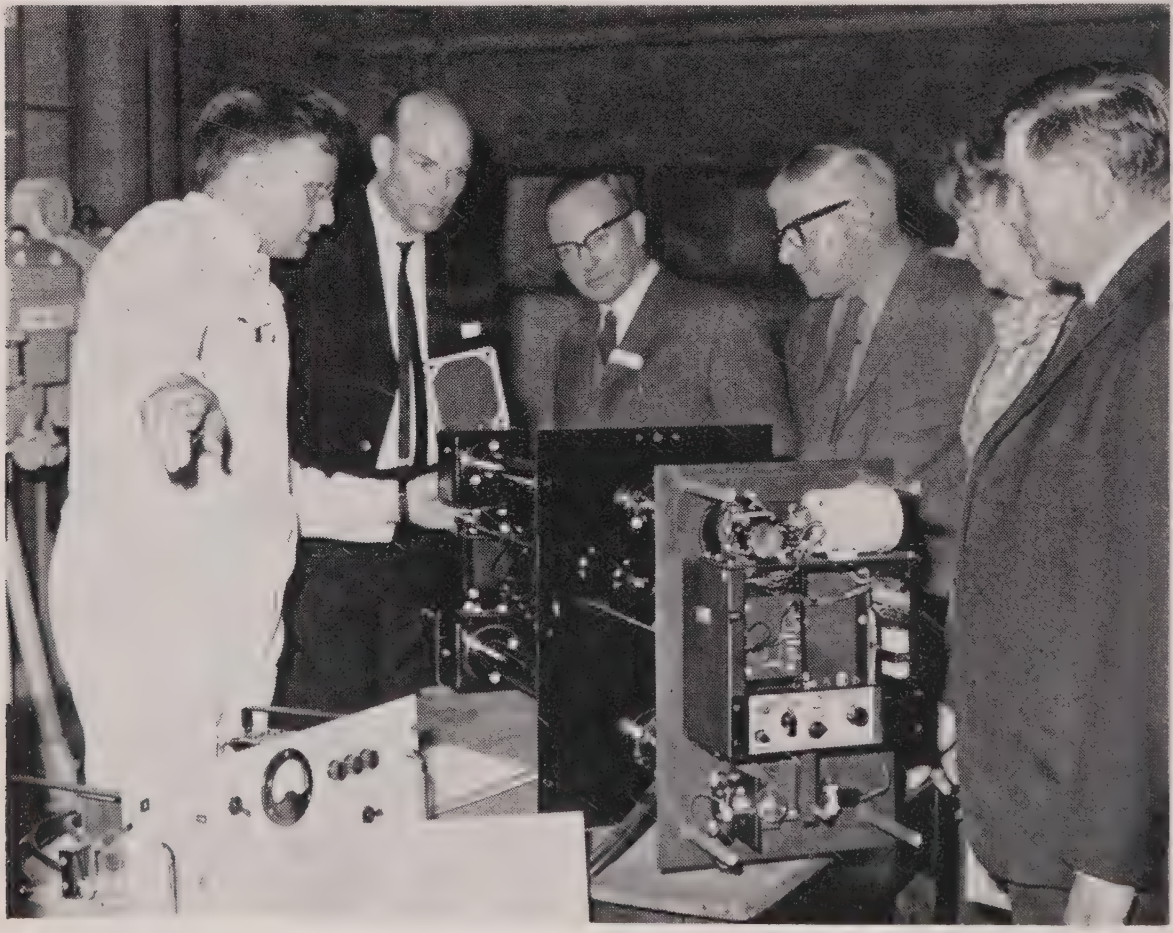
In addition to the meetings at which papers reported more fully on other pages were read, held by the **North West,** the **South East,** and the **Scottish** Divisions, other Divisions of the Society have also been active.

## WEST MIDLANDS

The annual meeting of the Division on 24 April was held at the Ironbridge power station, and the programme included an address by Arthur Hawkins, Midlands Region director of the CEGB.

Electricity, said Mr. Hawkins, was a peculiar product. It could not be stored and kept in stock for when demand rose, nor could they make customers queue at peak times as did other service industries. But the industry had its strengths, too. Electricity was a standard product, exactly the same whether it came from 40-year-old generating plant, from a nuclear power station, a hydro scheme in Wales, or over the cross-channel cable from France.

And now, after 20 years of worry about problems, said Mr. Hawkins, the industry had at last got to the point where it would start exploiting its strengths. Today, there were ample reserves of generating plant. Today there was a real choice of power



*The West Midlands Division at Ironbridge Power Station, inspecting a dust monitor used to record the dust burden in the chimneys. L. to R.: D. Wright, Asst. Instrument Engineer; Dr. Baden, Station Superintendent; W. L. Kay, Hon. Sec., W. Midlands Division; Cllr. S. G. Richards, Vice-Chairman, Warley P.H. Committee; Cllr. Dr. K. Rogers, new Divisional Vice-Chairman; and Ald. R. L. Pritchard, retiring Vice-Chairman*

*Members of the N.E. Division at the inspection of the Electricaire heated flats at Hendon, Sunderland*

station fuels—coal, oil, nuclear, and natural gas. And today the industry was just completing the largely unsung but quite epic construction task which had given them a new Supergrid transmission system with immense capability for efficiency and economy in operation, and with enough reserves built into it to serve the country's needs well into the 1980s.

The deputy chairman of the Midlands Electricity Board, was also a speaker at the meeting. He told delegates that out of every penny paid for electricity today, 0·4*d*. went on depreciation and capital charges. The more electricity was sold, the less the burden of those charges on each unit. Unless there was heavy inflation, he did not expect any further increase in electricity prices, and hoped to see a reduction in the early 1970s.

During the afternoon, delegates to the meeting saw how rapid development had been in the electricity industry when they toured the old Ironbridge power station, built in the 1930s, and the new "B" station, with an output of 1m. kilowatts, due to start producing power later this year.

## NORTHERN IRELAND

The Division met in Belfast on 19 March, for its annual meeting, at which an encouraging report for 1967 was presented. At the conclusion of the business meeting an address was given by Arnold Marsh, Director of the Society, reviewing the progress of clean air during his period of service with the Society. He expressed his gratification at being able to visit the Division again, and to learn of the excellent progress being made in Northern Ireland under their Clean Air Act, especially in the development of their smoke control area programme.*

## YORKSHIRE

The Yorkshire Division met in Leeds on 27 February to receive a talk on "Total Environmental Control" by H. G. Mitchell, of the Electricity Council. The talk described modern research into the ways of using waste heat from light, and incidental heat gains, etc., to provide comfort conditions in offices and factories. The 21st annual general meeting of the Division was held, also in Leeds, on 18 March.

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* *For the first time we include Northern Ireland in the Smoke Control Area Progress report table which appears on page 263.*

## NORTH EAST

(*Report from L. Mair, Hon. Secretary*)

On 18 April last the North East Division held its annual meeting at the Roker Hotel, Sunderland. During the course of the Chairman's address, delivered by Alderman B. N. Young, O.B.E., reference was made to the apathy and lack of progress being made in air pollution abatement in the North East region as compared with other regions and he expressed the hope that the current wide availability of electricity might now assist the situation. He concluded his remarks by extending a warm welcome to Arnold Marsh, the Director and Secretary of the Society, who was visiting the division on what would prove to be a farewell visit.

The election of officers resulted in the re-election of the Chairman, Alderman B. N. Young; the Vice-Chairmen, Councillor T. Prudham and Professor P. C. G. Isaac; the Hon. Secretary and Treasurer, L. Mair; and the Hon. Auditor, F. Ireland, City Treasurer of Newcastle-upon-Tyne.

This business meeting was followed by addresses on "The Future of Electricity Generation" and "Electricaire Installations". The first talk was delivered by D. A. Davies of the Central Electricity Generating Board who opened his address by referring to the increasing share of the total energy market taken by electricity which share had increased from about 6 per cent in 1930 to more than 30 per cent in 1960 and could well be more than 35 per cent by 1970. He referred to the dramatic changes in the pattern of primary fuel usage which had occurred in the United Kingdom during the previous ten years and made special reference to the position of nuclear power in relation to the generation of electricity.

The second speaker was T. P. Hartley, District Manager, Sunderland, of the North Eastern Electricity Board, who dealt with Electricaire installations and gave an outline of what was to be seen on the afternoon visit at Hendon district of Sunderland. Mr. Hartley gave a general description of the operation of particular installations in blocks of flats and illustrated his talk by reference to models and examples which were on exhibition in the meeting rooms. He made special reference to the economics of these installations and the methods of collection from the consumer.

A lengthy discussion ensued in which the Chairman and several representatives took part. Arising from the discussion it was proposed by R. Emerson, Chief Public Health Inspector of the County Borough of Hartlepool, and seconded by R. V. Robinson of South Shields, that the following resolution be sent to the Executive Council of the Society with a request that it be forwarded to the Minister of Housing and Local Government as a matter of urgency—

> "That this meeting urges the Minister of Housing and Local Government to rescind the designation of the direct operating electric fire to enable grant to be paid for the installation of electric fires in smoke control areas."

Delegates were then entertained to an excellent lunch as guests of the North Eastern Electricity Board at the conclusion of which Arnold Marsh, the Director of the Society, made a very amusing contribution with special reference to his impending retirement.

After lunch, in transport provided by the Board, members visited multi-storey blocks of flats in the Hendon Redevelopment, belonging to the Housing and Estates Department of Sunderland Corporation. These dwellings were comprised in 2-14 storey blocks and 1-20 storey block, as well

(*Concluded, page 276*)

# Nuclear Power

## *An Address to the North West Division of the Society on 28 March 1968*

**by W. J. Prior**

*Central Electricity Board, North West Region*

TO give a comprehensive talk on Nuclear Power in the time available to me this afternoon is not possible. Nuclear energy is one of many forms of energy. The release of energy by chemical change, such as combustion, has been known for many centuries and mankind has become accustomed to the effects and accepted them with very little questioning. The release of energy by physical changes, such as nuclear energy, has only been practical for about 25 years. The introduction of such a process into a world which is much more technically and politically aware than ever before has given rise to many questions and not a few fears.

The aspects which I intend to deal with here are those which I feel will be of interest to this gathering of the National Society for Clean Air.

Safeguards, the effect on environment, reliability and cost will be discussed. But, first, a little history.

Throughout the early years of the 20th Century scientists followed up observations by Bequerel in 1896 on radioactivity. The work involved Rutherford, Chadwick, Cockcroft and many others, but was entirely concerned with laboratory scale investigations into radioactive phenomena. Sufficient confirmation had been obtained by 1940 to prove the theory that atoms such as uranium could be fissioned, or split, and additional neutrons released to give further fissions. That is, a self sustaining reaction was possible. Additional elements, heavier than uranium, for example plutonium, could also be formed by neutron capture. Some of these elements were also capable of fission, and, therefore, sustaining a reaction.

The outbreak of war, particularly the entry of the United States in 1941, led to previous discovery and theory being applied to the war effort in the form of nuclear weapons. Such weapons can be made by collecting together sufficient material for an instantaneous chain reaction to occur. Such fissile materials are uranium 238, which can be extracted from natural uranium to give an enriched fissile material, and plutonium 239, which is formed from uranium 238 by neutron capture. This latter process occurs in a uranium fuelled reactor, the first of which successfully became self-sustaining in December 1942. Rapid development enabled a plutonium nuclear bomb to be built and used. The initial use of nuclear energy as a weapon of war (and its effects) has resulted in all other uses of nuclear energy being regarded with suspicion.

The necessary removal of heat from the early reactors by water or by air was an incidental problem when the reactor was used for military purposes, but it did give rise to efforts after the war to make commercial use of this energy. The first successful demonstration of commercial electricity production was at Calder Hall in 1956, where pressurized carbon dioxide is passed through the reactors to enable a higher grade heat to be made available for generation.

The Calder Hall and the sister reactors at Cross Chaple were not optimized for electricity production but showed sufficient promise to persuade Her Majesty's Government to support the first Nuclear Power Programme, which was commenced by the Central Electricity Generating Board in 1957. This programme was subject to economic and political changes and will have achieved an installed capacity of 4,500 MW's when the Wylfa Power Station in Anglesey is commissioned next year.

### Safety

Arising from the early history of nuclear energy the designers and operators of the earlier nuclear power stations have given the utmost thought and care to safety, by sound design, construction and maintenance, coupled with protective devices which fail to safety. Any action on safeguards must follow an assessment of the hazards. There is no point in safeguarding against incredible hazards. Indeed, it is not possible to do so. It is incredible, for example, for a nuclear reactor to behave as a nuclear bomb. There is thus no similarity between the military and civil use of nuclear energy in this respect.

Direct radiation and/or contamination by radioactive particles are, however, credible hazards. The safeguards against direct radiation are simple and knowledge of radiation shielding is adequate to enable plant to be designed to be fully effective in protecting employees. Distance itself is also an adequate safeguard against radiation which does not, therefore, become a matter affecting the public at large.

Contamination by radioactive particles could conceivably arise from effluents from the reactor and its associated plant. There are two sources of such active matter. Firstly, the fission products in the fuel elements which result directly from the nuclear reaction and secondly, activity induced by neutron bombardment of materials within or in close proximity to the reactor core.

The fundamental protection against the release of radioactive fission products is containment. (The containment of fission products in the fuel and the improvements which have taken, and are still taking, place, was shown on illustrations, which also indicated the change and eventual elimination of neutron induced reactivity in air discharged from the plant).

The first drawing displayed showed a uranium fuel element in its simplest form as used in the original Windscale plutonium production reactors—a natural uranium bar is encased in an aluminium sheath and the heat is removed by blowing air from the atmosphere through the fuel channel and discharging it via a simple filter to atmosphere.

The next step in development involved the provision of a steel pressure vessel to permit pressurization of the cooling circuit. $CO_2$ instead of air was used for removing heat from the fuel. This is the type of fuel element and channel used at Calder Hall, where the uranium bar is sheathed in magnesium alloy—Magnox. The heat is removed by the pressurized carbon dioxide and there is no direct connection between the fuel and the gas and the outside atmosphere. It was necessary, however, to maintain the temperature of the concrete shielding round the reactor at a reasonably low level and for this purpose air was induced to flow across the faces of the concrete, and subsequently discharged to atmosphere through filters. A small amount of neutron induced activity was, therefore, carried by the air into the atmosphere.

### Magnox Reactors

Further development of the Magnox reactors, as the magnesium alloy sheathed fuel reactors became known, utilized a prestressed concrete pressure vessel in place of the steel vessel. This was developed initially at Oldbury-on-Severn Power Station and is now incorporated in the Wylfa Power Station. Here again the fuel is sheathed in magnesium alloy, cooled by pressurized carbon dioxide, but the prestressed concrete vessel is cooled by demineralized water. No air cooling is involved and, thus, no activated air is passed to the atmosphere.

It is obvious, therefore, that the amount of active gaseous effluent has been reduced—even during the lifetime of the Magnox programme.

The fuel for the Advanced Gas-Cooled Reactor is slightly enriched uranium in the form of oxide rods which enable much higher ratings and temperatures to be achieved. The cladding is stainless steel to match the temperature levels obtained. Prestressed concrete vessels are again used and confidence in this form of containment and the security of the prestressed concrete vessel and the A.H.R. system has enabled the Ministry of Power, quite recently, to accept the advice of the Nuclear Safety Advisory Committee that future nuclear power stations of the Advance Gas-Cooled Reactor type can be placed much nearer to the centres of population than was previously permitted.

The very high standards of engineering design have encouraged commercial engineering insurance companies in the United Kingdom to accept a £5m liability against Third Party risks in respect of each nuclear power station site licensed by the Ministry of Power in accordance with the Nuclear Installations Act of 1965. Liability beyond the £5m per site is accepted by Her Majesty's Government, who to protect their interests attach conditions to each Site Licence.

These conditions require the power station to be designed and operated in an approved manner by way of approval of drawings, operating instructions, maintenance schedules and stipulating the necessary measures for the protection of the public and employees against radiation and contamination from the plant, irradiated fuel and other materials on site or in transit.

In addition to the cooling air already mentioned the only other gaseous effluent arising from present reactor operation is carbon dioxide. The quantity of carbon dioxide passed to atmosphere and the activity of all gaseous effluent is continuously monitored to ensure compliance with the authorizations given to each site by the Ministries of Housing and Local Government, and Agriculture, Fisheries and Food. The discharge of particulate activity along with such gases is prevented by special filters. The principal active gas present is Argon, which in the form of Argon 41, has a half life of only 110 minutes, it does not constitute a significant radiation hazard on or off site. Liquid effluents arise from the treatment plant for the cooling water in the irradiated fuel stores and from the decontamination of equipment. Tritium which is an isotope of hydrogen appears in the coolant gas driers. Tritium has a very low energy permitting relatively large amounts to be disposed of without hazard.

## Sampling

The authorizations granted by the two Ministries mentioned are in accordance with the Radioactive Substances Act of 1948 and 1960. Regular sampling of the effluents and the environment is required and results are notified to the Ministries who keep local authorities informed. Sampling commences at least 12 months before fuel is loaded into the first reactor on a site. The illustration now presented is shown to indicate that other effects, mainly bomb test fallout, have a far greater significance than the operation of a nuclear power station, on general levels of activity.

The reliability of nuclear energy has now been fully demonstrated. Some 134 reactor years of experience in the United Kingdom alone have confirmed that nuclear reactors are safe, have high availability and although those owned by the Central Electricity Generating Board in 1966/67 only represented 6·8 per cent of the system capacity, they generated 9·5 per cent of the Board's output. This output is, incidentally, equivalent to the whole requirements of England and Wales for electricity in 1934/35. The percentage of the Board's output generated from nuclear energy continues to increase. Throughout the whole of this experience there have been no incidents involving public, employees or plant attributable to nuclear causes.

## Review of Cost

The development of a new technology capable of progressing from the original demonstration to providing 10 per cent or so of the electricity demands of a country such as ours in a period of 25 years cannot be expected to be carried out without high initial expenditure.

Discussion on nuclear power costs always seem to give rise to a great deal of emotion and claims and counter claims are bandied from every street corner. I do not wish to add to the problem of deciding whether the claims or counter claims are correct. The cost per unit of electricity is a function of capital cost plus the unit fuel cost. The record shows as fact that the trend of capital costs of nuclear power stations is downwards.

The fuel cost at the nuclear stations is low and, as nuclear plants become more efficient, will reduce even further. Any increase in raw fuel cost will only have a small effect on the total unit cost. The advance gas-cooled reactors now being built at Dungeness and Hinkley Point will use turbines which have the same steam conditions as those installed in the Generating Board's latest coal and oil-fired stations. The virtual elimination of boiler losses will result in higher thermal efficiencies than those obtainable from such conventional stations.

Technical and economic factors favour the continuous running of nuclear power stations. The low fuel costs obtained should ensure that electricity supplied to the system at off peak times will be cheap.

## The Future

Construction of the first power station in the United Kingdom second Nuclear Programme of 8,000 MW's. commenced in 1966 at Dungeness and the second and third stations at Hinkley Point and Hunterston commenced last year. These stations are each of 1,200 MW's capacity. The Central Electricity Generating Board expect nuclear power to provide some 20 per cent of electricity requirements in England and Wales by 1975.

The use of nuclear energy is not entirely confined, nor need be entirely confined, to the production of electricity. Desalination and district heating schemes have been considered and although not showing economies in the United Kingdom at the present time have potential in many other areas of the world. I would not wish, however, to insult the intelligence of my audience by pretending that I did not hope that electricity would be the major medium by which nuclear energy was likely to be distributed.

It does not seem possible to have the industrialized society which is so necessary to the livelihood of the people of this country without encroaching upon natural amenities. The development of nuclear power stations which have a minimum effect on environment and whose effluents are limited to small quantities very carefully controlled by statutory authorization given before operation commences, can only result in the furtherance of the interests of your Society, and ensure that nuclear energy is the fuel of the future.

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## Divisional News — *concluded*

as 108 maisonettes. Members were divided into parties and were conducted through selected dwellings by representatives of the North Eastern Electricity Board and the facilities and information afforded by the occupiers were much appreciated. At the conclusion of the visit of inspection members returned to the Roker Hotel where they partook of tea kindly provided by the Board after which the meeting dispersed after a most useful, pleasant and interesting day.

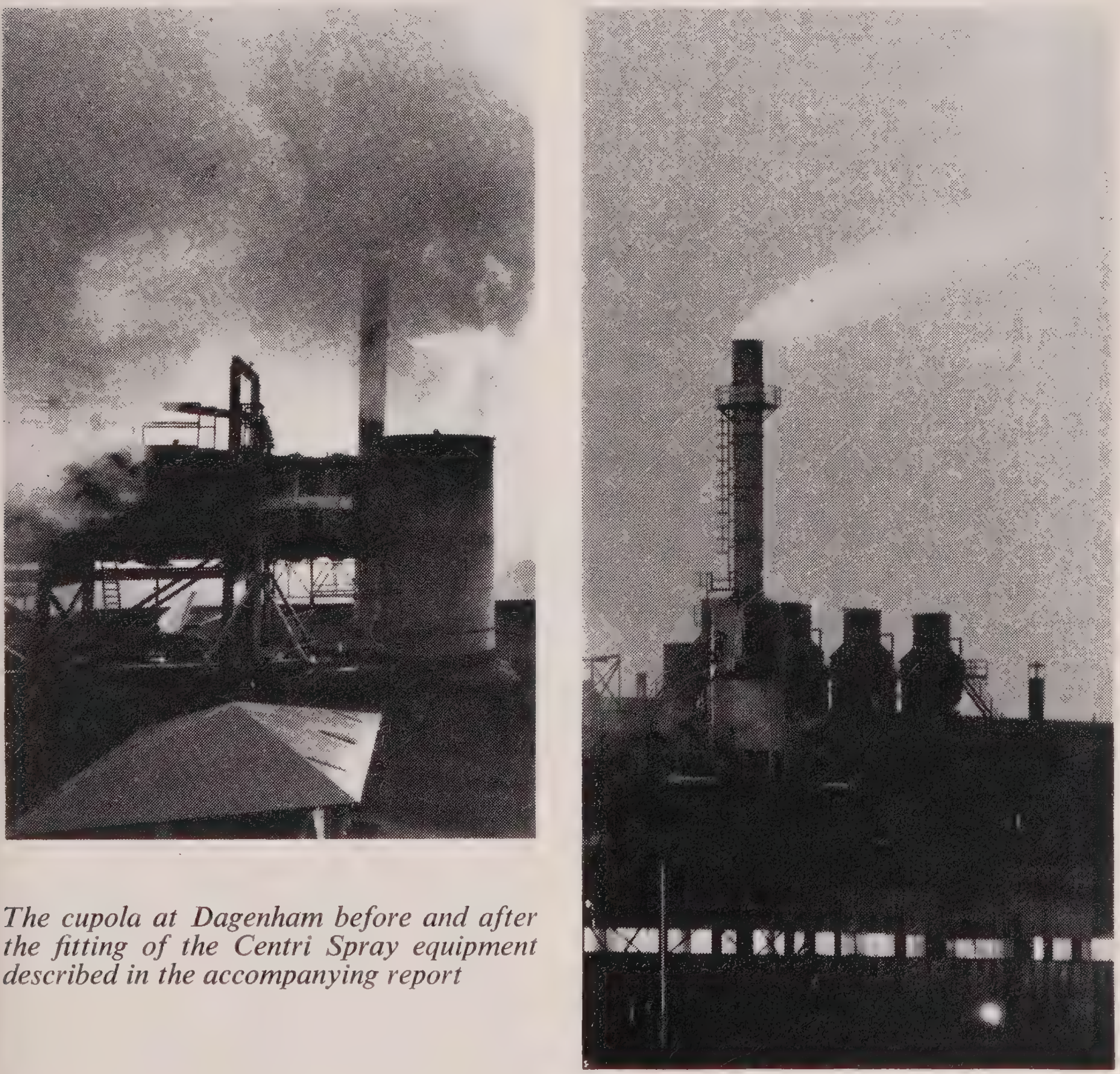
# *Contributions to Cleaner Air*

## News from Industry

### NEW AIR POLLUTION CONTROL PLANT AT THAMES FOUNDRY

A reduction of 97 per cent in the amount of solid matter emitted from one cupola of the five at the Ford Motor Company's Thames Foundry at Dagenham. A reduction from 600 lbs an hour of grit, dust and fumes emitted in a heavy reddish-brown cloud to 18 lbs an hour in a white plume from a 150 ft. stack. That is what has been achieved by a new air pollution control plant recently installed by Centri Spray Ltd., of Croydon. Tests already made show that this plant is very successful; Fords therefore intend that Centri Spray shall install two further plants, one serving each of the two remaining pairs of cupolas. When this has been done, and the hope is that the work will be completed before the end of 1968, the air round Dagenham should be very much cleaner.

The cupola to which the plant has been fitted is one of the largest in Europe; it smelts between 30 and 35 tons per hour and is used for the production of nodular iron. The air



*The cupola at Dagenham before and after the fitting of the Centri Spray equipment described in the accompanying report* pollution control plant itself embraces four distinct processes. It was expensive to install, costing about £200,000; and expensive to run. The exact running costs are not yet known, but it is estimated that they will be several thousands of pounds a year. The plant was designed by Centri Spray, prefabricated at their works at White Waltham, and then erected on the site.

The first cleaning process is in the cupola itself. Gas burners have been fitted round the walls just above the charging port. These burners are ignited automatically if the temperature drops below 1300°F and then burn off much of the sulphur dioxide and carbon monoxide. If the temperature reaches 1800°F, when it is sufficient to ignite these waste gases, the burners cut out. Their main purpose is to burn off the waste gases when the fumes are at their worst, just after the cupola has been charged.

The remaining waste gases and fumes now at a temperature of 1600° instead of passing out of the top of the cupola as hitherto, then pass through a refractory lined duct to a "down-comer" for preliminary cooling and removal of the heavier particles. Here 1700 gallons of water a minute is passed through the gases by means of three powerful impellers. The heavy sludge is collected at the bottom of the down-comer and led away to settling tanks.

The now rather cooler gases are drawn away from the down-comer by two 40,000 c.f.m. fans and enter two stainless steel-built high efficiency collectors. 450 gallons of water is circulated at 1500 r.p.m. through each of these collectors every minute and this removes most of the smaller particles. The sludge is again drained away to settling tanks, and the cooled clean gases pass to the moisture eliminator for drying.

The eliminator, which is built immediately under the stack, is a chamber 30 ft. high and 14 ft. in diameter packed with thousands of plastic "pall rings" on which the water vapour condenses. The wet gases enter the eliminator at the foot of the chamber, pass through the pall rings, deposit most of their water content which is drained off, and pass up the stack where they emerge as a clean plume.

This is a large and complex plant which requires efficient controls and safety devices. There are control rooms for the fans and pumps with panels fitted with electronic warning devices. The cap on the cupola and that on the down-comer are controlled by a device which will open them automatically if the temperature of the waste gases exceeds a safe limit.

Extensive tests at each stage of the cleaning process have been carried out by N.I.F.E.S. and A.G.E.M. laboratories. Centri Spray hope that as a result of the information which they obtain from these tests, they will be able to design less sophisticated, and therefore less expensive, plants which can be fitted successfully to smaller furnaces.

We think that is a big step forward in the cause of clean air, and it is gratifying that it has been accomplished by firms who are both members of the Society, the Ford Motor Company, who operate the furnace, and Centri Spray who have manufactured and installed the cleaning plant. Both are to be congratulated on what has been done.

## NEW BOILER DESIGN

At a press conference held on 18 April in London, Mr. J. K. Smith, Chairman and Managing Director of the Beeston Boiler Co. Ltd. of Nottingham told his audience about his Company's development of an entirely new type of industrial cast iron boiler, the most important feature of which is that although smaller in size, it does the work of much larger boilers.

Beeston Robin Hood SERIES 5 Boilers for oil and gas firing (rating: 300,000—10,000,000 Btu/h.) are designed to take full advantage of the high heat transfer rates resulting from the use of positive pressure combustion in the primary combustion zone. In addition the gas velocities in the secondary zones have been increased, again resulting in high heat transfer rates so that output for output the SERIES 5 Boiler occupies very much less space than that required by the conventional cast iron sectional boiler, resulting in much smaller boilerhouses being required.

A feature of particular interest to our readers is that as the boiler is operated on a fully forced draught combustion system, it is claimed that no chimney draught is required to overcome boiler resistance and the chimney is only required to be designed to clear the flue gases and "to meet any statutory regulations in respect of height".

**Coalite Peg Prices**

For the third year running, Coalite & Chemical Products Limited, the country's biggest independent producers of reactive solid smokeless fuel, are pegging their prices to merchants.

In addition, whereas the period of specially reduced summer prices for most solid fuels runs only from 1 May to 30 September. Coalite's summer price reduction of 25*s*. per ton will apply a full month longer, until 1 November, when winter prices will be resumed.

A spokesman for the company said today: "Coalite are making every effort to peg costs and we hope that merchants will pass the full benefit of our summer price reductions on to the housewife."

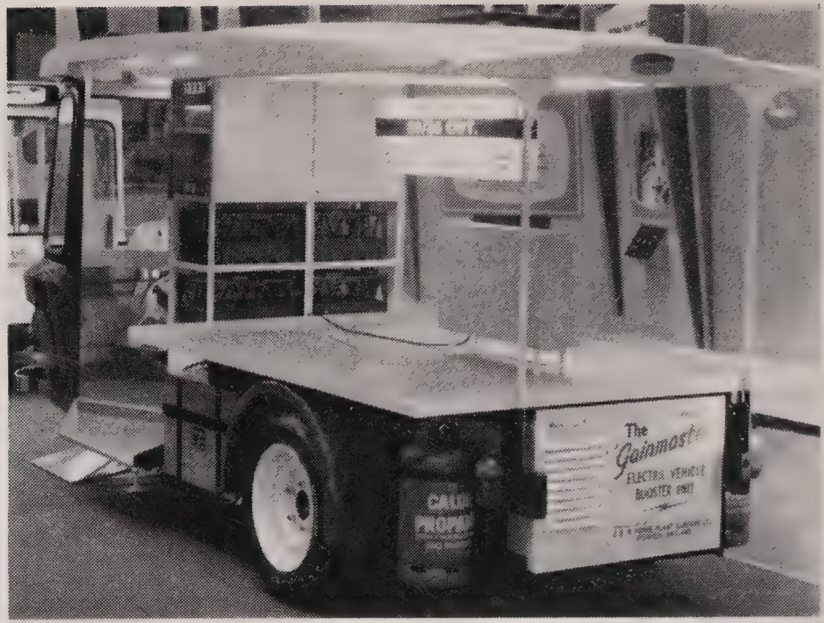
## ELECTRIC VEHICLE WITH BOOSTER

A specially designed battery booster unit which increases the range of electric vehicles is introduced by G. & M. Power Plant Company, Ltd., of Whitehouse Road, Ipswich, Suffolk. The company has just completed a

To the Central Electricity Generating Board, smoke means more than impure air. It means unburnt carbon, wasted power.

At modern coal-fired power stations, over £3,500,000 is spent on clean air measures —tall chimneys and dust extraction plant.

**Better — cleaner — things are electric**



*The Gainmaster booster fitted to an electric vehicle, showing the unit and the propane gas cylinder*

series of successful trials which, they claim, is bound to revolutionize electric vehicle transport.

This has been achieved by the use of a unit known as the Gainmaster, which includes a propane-fired engine of special design to be used, as required, to recharge the batteries. Extended range or speed is of course the main advantage, but from the air pollution point of view the gas used as fuel gives rise to no smoke, fumes or odours.

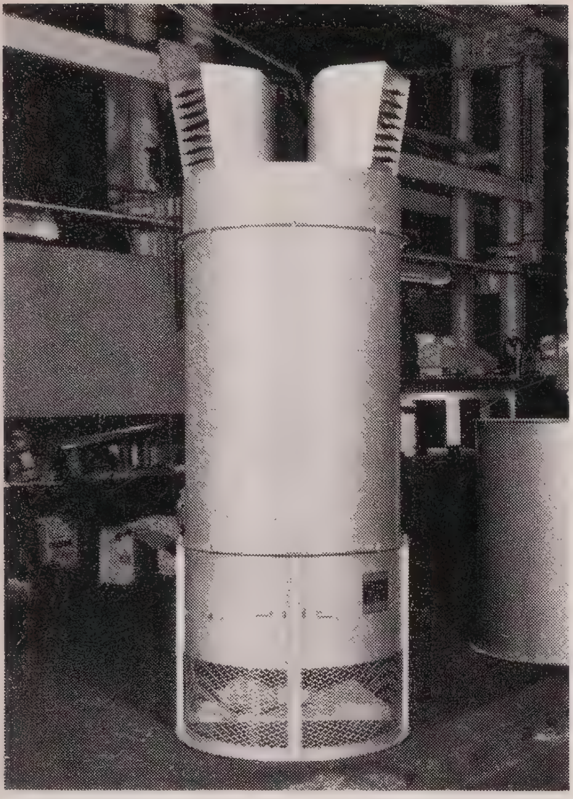
The electric vehicle has the advantage of quietness, and to retain this the booster unit, which uses a high quality engine with a Vacuo-Elo suction cooling system, as almost entirely enclosed in a sound-proofed compartment. It has been designed to give quick and easy attachment to any electric vehicle.

Tests on a typical 10 cwt. vehicle have shown that the unit, which has a maximum output of 2,000 watts, can increase the range of the vehicle from 60 to 100 per cent.

It could be argued that if one is using an engine driven booster in a vehicle to increase its range then why not have a conventional engine driven vehicle? The answer is that the "Gainmaster" is employing a small 5 h.p. engine which, on its own would be quite inadequate as a means of propulsion. The vehicle is essentially an electric vehicle and the booster is a means of extending the desirable characteristics of the electric vehicle to a point hitherto impossible. G. & M. Power Plant do not claim to eliminate the use of the mains charger. In fact the use of the "Gainmaster" should be confined to as few hours as possible, so that at the end of its round the vehicle may still return to the depot with its batteries in a discharged state. Should the vehicle arrive home with the batteries not fully discharged it will be obvious that full use will not be made of the wall charger and as the cost of electricity in terms of watts is considerably less than the cost of propane gas used to develop watts by the booster, it is obviously economical for the operator to ensure that the batteries are used to the fullest extent.

During the trials the unit was found to use approximately 2 lbs. of propane gas per hour, while running and no appreciable change in temperature was noted in the battery electrolyte.

Though these trials were carried out with a small 2 k.w. unit, G. & M. Power Plant have larger models under development suitable for vehicles not customarily designed as electrics, such as refuse carts, fire appliances, wholesale town delivery trucks and even city buses.



*We illustrate one of a new series of fully automatic oil-fired heaters, covering the range 150,000-1 m. Btu/h, in the "Gemini" range of the Turbomatic Engineering Co. Ltd. By the use of monocoupe construction and high grade stainless steel for the combustion chamber a compact series of units has been produced providing fully automatic totally enclosed tamper-proof operation, for factory heating. There is a choice of four alternative outlet heads to cover all applications.*

### New B.S.—Analysis of Fuel Gases

British Standard 3156—Methods for the sampling and analysis of fuel gases—published in 1959 has now been completely revised. The revision is accompanied by a change of title to "*Methods for the analysis of fuel gases*" as the sampling of gases is now to be dealt with in a separate standard, which is being drafted.

Part 1 of the standard, General Analysis, and Part 3, Combustion Characteristics, are already available, and Part 2, Special Determinations is now published. This gives methods for the determination of the sulphur compounds usually met with in fuel gases, of condensable vapours (such as benzole), nitrogenous gum, tar fog, ammonia, hydrogen cyanide, carbonyls, and water vapour. The assessment of odour is also described and a note included on the determination of oxides of nitrogen. Certain of these methods are not applicable to gases supplied at high pressure and a further part of the standard covering such gases is in preparation. Gas chromatographic methods have not yet been defined and these will be the subject of an additional part of the standard at a later date.

Copies of B.S. 3156: Part 2: 1968 may be obtained from the B.S.I. Sales Office, 101/113 Pentonville Road, London, N.1. Price 30s. each (postage 2s. extra to non-subscribers.)

### ELECTRO-HEAT FOR INDUSTRIAL PROGRESS

"Exciting developments in electro-heat foreshadow an accelerating use of electricity for metal melting and industrial heat processing generally, with its inherent advantages of improved product yield, closer quality control and overall economy of operation."

This was said at Brighton on 13 May by C. T. Melling, CBE.,CEng., FIEE., Chairman of the British National Committee on Electro-Heat. He was addressing 800 delegates from 20 countries attending the opening session of the Sixth International Congress on Electro-Heat, being held in Britain for the first time.

"This Congress provides an opportunity to link together the work of producers and users of electro-heat," said Mr. Melling. "Developments in the use of electricity depend on the initiative and enterprise of electricity supply authorities and the manufacturers of electrical plant and equipment. The fundamental purpose of this is to help the purchasers of electricity, the rapid advance of electricity consumption being a measure of their satisfaction.

"In organizing this Congress, the UIE has set out to help users of electro-heat to get the best value for their expenditure on electricity, electric furnaces, and other electrical plant," said Mr. Melling. "Industry now uses electro-heat in greater quantities and for more purposes than ever before. This has resulted from a careful assessment of the many factors which contribute to the total economy of industrial heating—not merely the cost of the units of heat consumed, but the capital cost, operating and maintenance costs, and, in addition, the many benefits resulting from using electricity such as ease of application, close control, whether manual or automatic; and freedom from contamination of product and environment."

## DISTRICT HEATING NEWS

The National Coal Board has announced the opening of new district heating installations at Edmonton and Washington, Co. Durham.

At Edmonton the first instalment of a scheme to be developed into the mid-1970s was opened on 10 April. It supplies heat for 400 residents in a 23 story tower block built by the London Borough of Enfield as part of the Edmonton central development plan.

At present heat is being supplied from a single boiler rated at 6 million Btus/hr housed in a temporary structure (built of National Coal Board manufactured bricks) close to the newly-tenanted tower block, and operated by Associated Heat Services Ltd., as agents for the National Coal Board. Associated Heat Services are a part-N.C.B.-owned company created to provide and maintain a heat service to bulk users.

As the scheme matures a central boilerhouse will be erected on land near the centre of the development. It will house up to six boilers, each rated to a capacity of 28 million Btus/hr which will be automatically stoked by mechanical methods with washed small coal.

Also recently opened was a coal-fired boiler house which provides all the heating and domestic hot water for 673 flats at Washington. Three automatic, high-efficiency boilers will burn about 3,000 tons of coal a year smokelessly in full compliance with the Clean Air Act.

The boilerhouse was built by the National Coal Board. High pressure hot water leaves there at a guaranteed temperature of 290 degrees F. and is carried in closed circuit underground mains to the flats.

The heat is metered at the boiler-house exit and the Council is concerned with its subsequent distribution and utilization.

The installed capacity of the boiler plant is 21,000,000 Btus/hr. and the present anticipated heat supply approximately 564,300 therms per annum. The boiler plant consists of three G.W.B. Vekos Powermaster Coal fired boilers; two rated at 8,000,000 Btus/hr. and one at 5,000,000 Btus/hr. Provision has been made for additional boilers, if required, by a simple extension to one end of the boiler house.

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### Refresher Course

The 15th Annual Residential Refresher Course for Works and Plant Engineers organized by NIFES will be held at Brasenose College, Oxford from 16-20 September, 1968, inclusive.

This Course has many features of particular interest to works managers, works and plant engineers, and the technical staff of municipal, industrial and public undertakings. The programme will include talks on Incineration and Utilization of Waste Materials, Water Treatment, Practice Affecting the Design of Industrial Chimneys, and The Importance and Principles of Energy Costing.

The fee for resident members is £33, and full details can be obtained from P. Snaith, Secretary of the Course, NIFES, 24 Bruton Place, London, W.1.

### Farseeing Request

"Factory owners at Widnes, Lancs., are being asked to restrict smoke on 17 May, so that the Queen can have a clear view from a rooftop garden when she visits the town to see 'Operation Spring-clean'." —*Daily Express.*

# Clean air is automatic with clean electricity

**For clean air areas, the most natural choice is Electricity for space heating, water heating and air conditioning in the home, in industry and commercial buildings. Electricity is the only fuel that causes no combustion. It's always there to be switched on. Nothing to store. Nothing to dispose of.**

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**Storage Radiators** The most easily installed and practical system for existing property. Wide variety to choose from, including fan assisted models for greater flexibility and control.

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**Water Heating** By Electricity, immersion heaters or self-contained heaters—a wide range for home, office or factory. Negligible maintenance, easily installed and economical in use.

**Air Conditioning** Gives maximum effect to controlling environmental conditions in offices, shops, hotels and public buildings.

**Better things are electric**

*Issued by the Electricity Council, England and Wales*

# Air Pollution Abstracts

**1056. Effect of the Dispersion of Soot in Deposition of 3, 4-Benzpyrene in Lung Tissue of Rats.** Pylev, L. N. (Hygiene and Sanitation, Apr.-June 1967, **32,** Nos. 4-6. 174-178). The cancerogenic substances present in the environment are found as absorbates in soot and dust particles. The author studied the elimination of 3, 4-benzpyrene from the lung tissue of 120 rats when introduced in combination with various types of soot. The quantity of 3, 4-benzpyrene extracted from the lungs of killed rats was determined with the aid of spectrophotometer SF-4A. Chimney soot was found to retain benzpyrene in the lung tissue while thermal one promoted its quick elimination.

**1057. Effect of Motor Vehicle Exhaust Gases on Atmospheric Pollution in Dwellings and in a main street.** Berdyev, Kh. B. Pavlovich, N. V. and Tuzhilina, A. A. (Hygiene and Sanitation, Apr.-June 1967, **32,** Nos. 4-6. 424-426).

1. The investigations revealed very considerable concentrations of carbon monoxide, nitrogen oxides, lead compounds and dust in the atmosphere of the main street and in the living premises, exceeding the maximum permissible concentrations.

2. The 50 per cent increase in the density of vehicular traffic in 1963 in comparison to 1961 (from 780 to 1,200 vehicles per hour) increased only the carbon monoxide concentration in the street air (by 50 per cent), all other indices remaining at the previous level.

3. A comparison of the concentrations of health hazards at different levels revealed the highest concentration of carbon monoxide in the living rooms of the third storey and those of dust and lead in the first storey. The concentrations of nitrogen oxides were the same in the street, in the first and in the third storeys.

**1058. Large scale technical experiments in flue gas desulphurization.** Zentgraf, K. M. (In German.) (Staub, March 1968, **28,** No. 3. 94-100). The state of development of three methods for flue gas desulphurization (the additive method, also called *Wickert* method, *Reinluft* method and *Still* method) is reported. The *Wickert* method has been tested on a slag-tap-fired boiler of a maximum steam output of 110 t/h. The results are compared with measurements carried out for oil-fired boilers. An experimental plant according to the *Reinluft* method, designed for a flue gas rate of 33,000 $Nm^3/h$, has been in operation since November 1966. Tests in a full scale industrial plant according to the *Still* method (20,000 to 30,000 $Nm^3$ flue gas/h) were undertaken in November 1967. Operating costs of the three methods are discussed.

**1059. Prospects for a practical application of flue gas desulphurization.** Brocke, Dipl.-Ing Werner. (In German.) (Staub, March 1968, **28,** No. 3. 101-107). In the U.S.A., in Japan, England, France and in the German Federal Republic extensive work is carried out at a high expense on the development of flue-gas desulphurization methods. The state of development and the evaluation of costs of the individual methods are discussed, and also the problems of utilization, further treatment and disposal of final products are considered. It appears to be necessary to deal more efficiently with the problems associated with final products, because fully developed methods for flue-gas desulphurization will be available in the nearest future. Operating costs and preferred fields of application of these methods are reported.

**1060. Toward a "Definitional Model" of Public Perceptions of Air Pollution.** Crowe, M. Jay. (J.Air Poll.Contr.Ass., March 1968, **18,** No. 3. 154-157). From a public attitudinal survey conducted in a city in Southwest Pennsylvania, different levels or aspects of public perceptions of air pollution are suggested. This "model" of public definitions of air pollution was analyzed in terms of selected social characteristics such as education, socioeconomic status, sex, residence, etc., in the attempt to isolate factors that may influence a person's perception of air pollution. The definition of air pollution involves a whole host of factors, but it appears that level of education, socioeconomic status, and residence have the most influence in terms of the various meanings attached to air pollution. Modification and clarification of the model through further research may enable more insight of public awareness and concern with air pollution as an urban problem.

**1061. Carbon Monoxide in the Atmosphere.** Robbins, R. C., Borg, K. M. and Robinson, E. (J.Air Poll.Contr.Ass., Feb. 1968, **18,** No. 2. 106-110). A carbon monoxide analyzer has been developed which is capable of continuous measurement of the carbon monoxide concentration in the atmosphere. The operating principle of the instrument is the reaction of carbon monoxide with hot mercuric oxide followed by the photometric determination of the mercury vapour produced. Oxygenated hydrocarbons and olefins are quantitatively detected. Those normally present are in the ambient atmosphere in low concentrations relative to CO. Hydrogen and methane in the atmosphere do not interfere with the CO analysis. Measurements of atmospheric CO concentrations in California, Greenland and Oregon seem to indicate that CO content is an air mass characteristic. North Pacific marine air mass concentrations may be as low as about 0·040 parts per million (ppm) CO, while the air mass over continental California seems to be characterized by CO levels of 0·5-1·0 ppm or greater.

**1062. The Need for a Pollution-Free Vehicle.** Sweet, A. H., Steigerwald, B. J. and Ludwig, J. H. (J.Air Poll.Contr.Ass., Feb. 1968, **18,** No. 2. 111-113). The immediacy of the need for pollution-free vehicles is investigated by projecting to 2,010 vehicle emission densities for eight urban areas and measures of population exposure to pollution for four cities. Three degrees of emission control are applied. Application of 50 per cent control to 1968 automobiles maintains emission densities below present levels for the next 20 years, but is less effective in reducing population exposure to pollution, in some cases only slowing the rate of growth. Application of 50 per cent control in 1968 and 80 per cent in 1973 fails to reduce emission densities below 50 per cent of the present. Reduction below 50 per cent will eventually require an essentially pollution-free vehicle in many areas.

**1063. Control of Particulate Emissions.** Walker, Alan B. (Proc. of the Metrop. Engnrs. Council on Air Resources, N.Y. 1967). This paper reviews recent applications of basic particulate control devices. Items include various applications of electrostatic precipitators, trends in particulate collection efficiency by utilities, application of wet scrubbers, synergistic effects of precipitator scrubber combinations, application of variable orifice scrubbers, interrelationship between demands for gaseous emission control and particulate emission control, application and cleaning of fabric filters.

**1064. Removal of Sulfur Oxides from Power Plant Stack Gases.** Slack, A. V. (Proc. of the Metrop. Engnrs. Council on Air Resources, N.Y. 1967). Many problems, yet unresolved, some not amenable to cost estimating, will affect the feasibility of integrating removal processes into the power and fertilizer industries. These include limestone injection, recovery processes, inadequacy of existing plants, power plant obsolescence, difficulty in operating power and chemical recovery units simultaneously. Process problems discussed include limestone injection, low grade of recovered products, residual dust, cost, corrosion, pressure drop and attrition.

**1065. Influence of wind direction on $SO_2$ Concentration in Hamburg.** Gräfe, K. (In German.) (Archiv für Hygiene und Bakteriologie, **151,** No. 8. 1967). The records taken by 27 measuring points in the course of nine years have been entered into a map as $SO_2$ wind-roses. The author explains that those sources of the emissions can be determined by means of this method, which are essentially increasing the basic load. Besides the use of the immission characteristics, such plottings are deemed useful for detailed air-hygienic advice.

**1066. Photochemical Air Pollutants and Their Effects on Men and Animals.** Jaffe, Louis S. (Arch. Environ. Health, Feb. 1968. **16,** 241-255). When concentrations of photochemical oxidants are used as measures of photochemical smog intensity, a number of specific biological effects on man and animals based on both atmospheric and laboratory studies have been documented. Photochemical oxidants, such as routinely found in urban communities as measured by continuous air monitoring instruments used by federal, state and local agencies, cause a repeated and continuing biological impact on man and animals in every region of the country. The degree and types of the documented biological effects are dependent on the local community atmospheric level attained and the frequency of occurrence.

**1067. The Long Range Heat Supply, incineration and electric storage heating for clean air in Munich.** Bachl, Herbert. (In German). (Staub, Feb. 1968. **28.** No. 2. 65-71). As a result of special meteorological conditions, inversions frequently occur in Munich. First, the results of immission measurements are reported, which were carried out in different town regions, and then the preventive measures introduced are explained. The influence of different types of fuel and of various heights of chimneys on $SO_2$ emissions is discussed. The development of long range heat supply and of electric heating is combined with direct burning of natural gas. The power plant which is situated in the town and comprises installations for long range heat supply and for refuse incineration has proved to be highly expedient. Coal is preferably used as the additional fuel in the power plants situated at town outskirts, whilst natural gas is used in the power plants situated in the town centre.

**1068. Disposal of community wastes.** Stephenson, J. W. (Public Health Inspector. Nov. 1967. **76.** No. 2. 98-110, 113-114, 132). Community waste disposal is a problem of increasing complexity. It is a challenge to local authorities which must be met by adequately financed research, ingenuity and determination to devise and use techniques appropriate to the problem. Some of the approaches to disposal of solid wastes are controlled tipping, incineration, pulverization and composting. The disposal of liquid wastes is dependent on treatment processes for sewage such as sedimentation, biological filters, humus tanks and activated sludge. The disposal of trade wastes can have a profound effect on the efficiency of sewage disposal works. Some causes of trouble have been listed together with the problems created.

**1069. The design of refuse disposal equipment.** English, M. C. (Simon Engineering Review, 1968, No. 10, 8-14). The old human problem of refuse and its disposal has become more acute and is now world wide. In Britain the daily output of domestic refuse has increased from 1·7 to 2·1 lb. per head over last 12 years. Obsolescence of the domestic open fire and more use of packaging material are the factors mainly responsible, and a high proportion of paper and bulky refuse create new disposal problems. The emphasis is now on volume reduction and methods of bulk-handling at all stages of the collection-disposal process, and on control of dust, smoke and gases. So far, the evidence seems to be against on-site disposal as an economic method; an interesting innovation for bulk-handling is the system of pneumatic transportation of refuse to a central point. Methods of compaction and of permanent reduction for final tipping are discussed. Controlled tipping could still have a future with the new technical developments. Incineration and pulverization processes are compared; the cost of the former being far higher, it is more suitable for big cities, although the two processes are not necessarily alternatives. Continental Europe favours the utilization of heat from large incineration plants, whereas Britain and U.S.A. do not, on the whole. The author gives examples of major incineration plants built within the last four years and describes the differing organization of local government and responsibility for public utilities in the countries concerned. Achieving cost efficiency is most important and the latest development is a revival of interest in direct incineration, like the new 210-tons-a-day plant being built in Derby. The tendency to concentrate on bulk handling of refuse conflicts with the salvage of potential raw materials for industry, but with larger quantities of refuse, salvage operations could be profitable. It is concluded that the greatest need for the process of refuse collection and disposal to be seen as a whole.

**1070. Instrumental Methods for the Detection of Higher Oxides of Nitrogen in Nitrous Oxide.** Shaw, J. T. (Brit.J. Anaesth., 1968, 40, 299-303). This paper discusses the possible application of instrumental methods used by the British Coal Utilization Research Association for flue gas analysis to detect the contemination, by higher oxides of nitrogen, of nitrous oxide (N O) intended for use as an anaesthetic. Two galvanic instruments sensitive to 1 ppm v/v of nitrogen dioxide ($NO_2$)—or, when supplemented by a pre-oxidizer, of nitric oxide and nitrogen dioxide ($NO + NO_2$)—are described; either might be adapted to actuate an alarm. The methods are discussed in the light of governmental standards of air quality.

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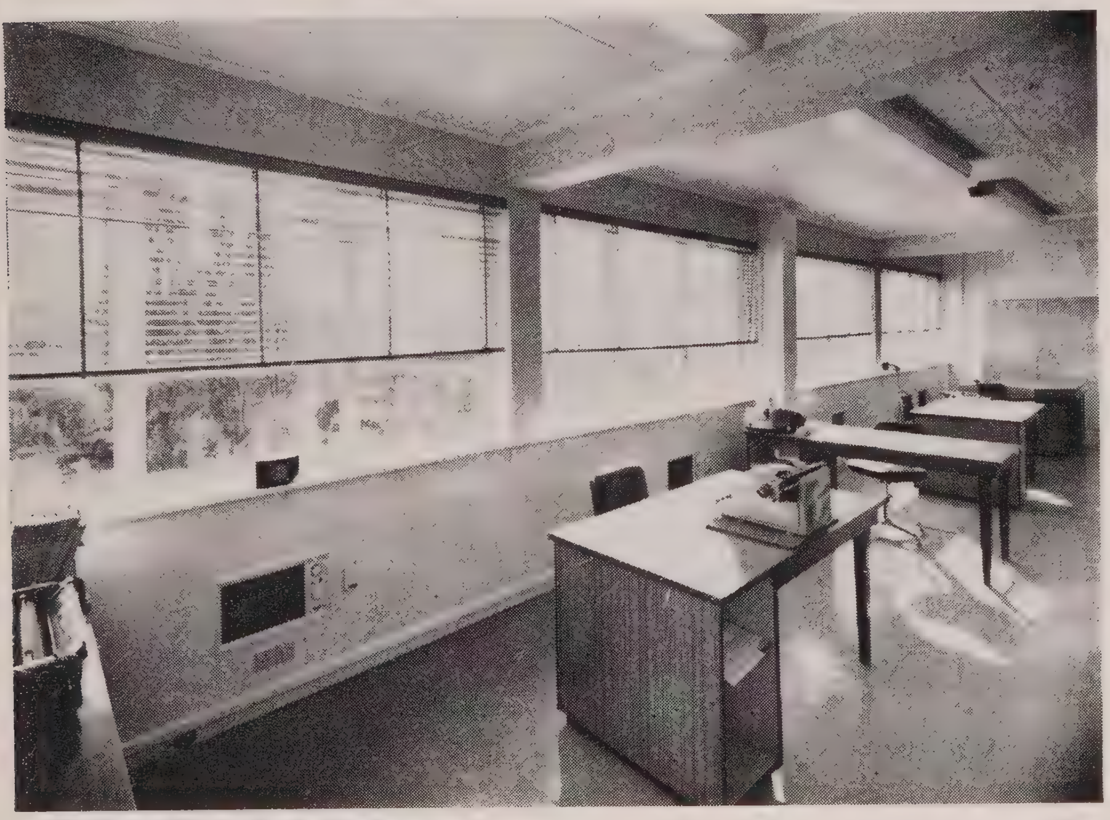

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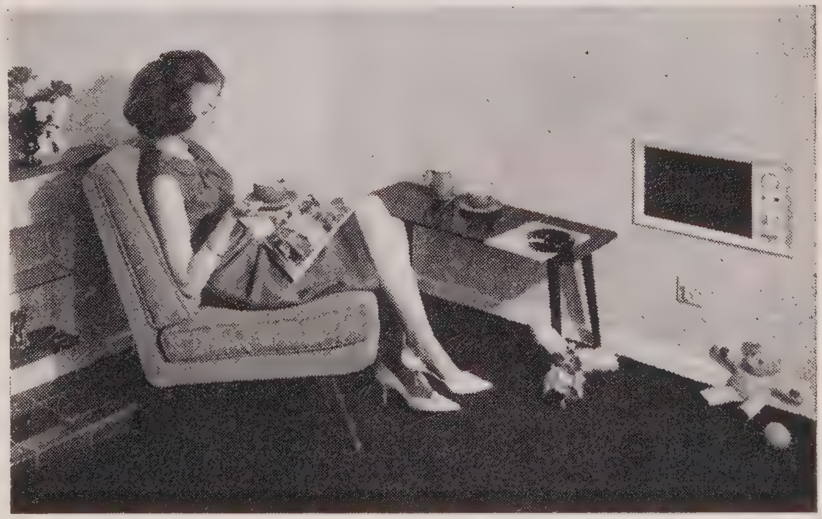

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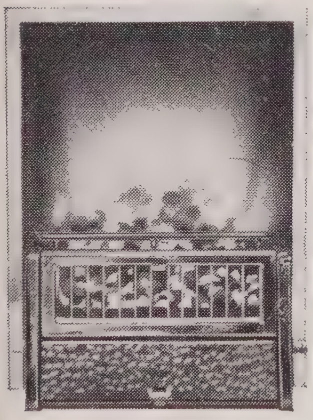

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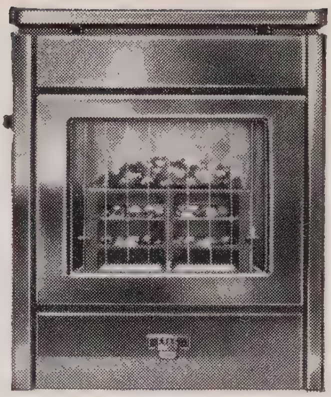

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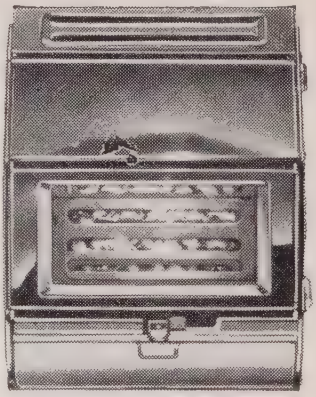

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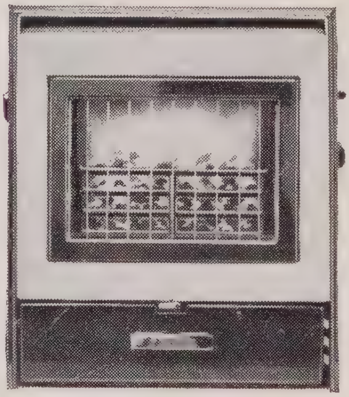

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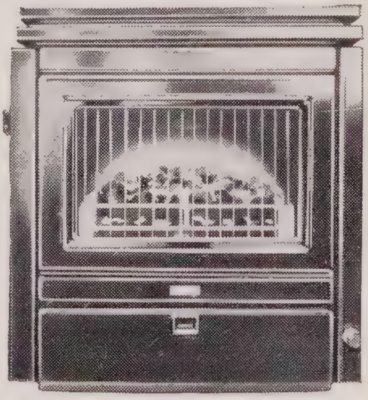

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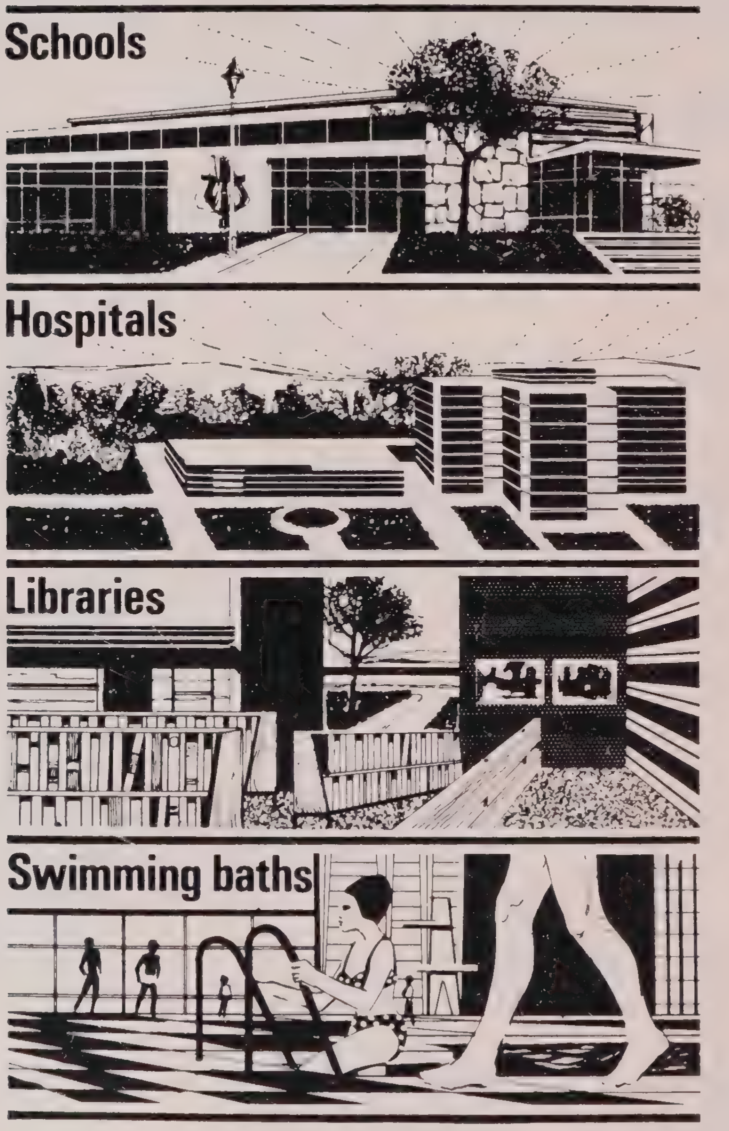

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North Sea Gas and the Consumer ✶ London Smoke
Dealing with Air Pollution in West Bromwich

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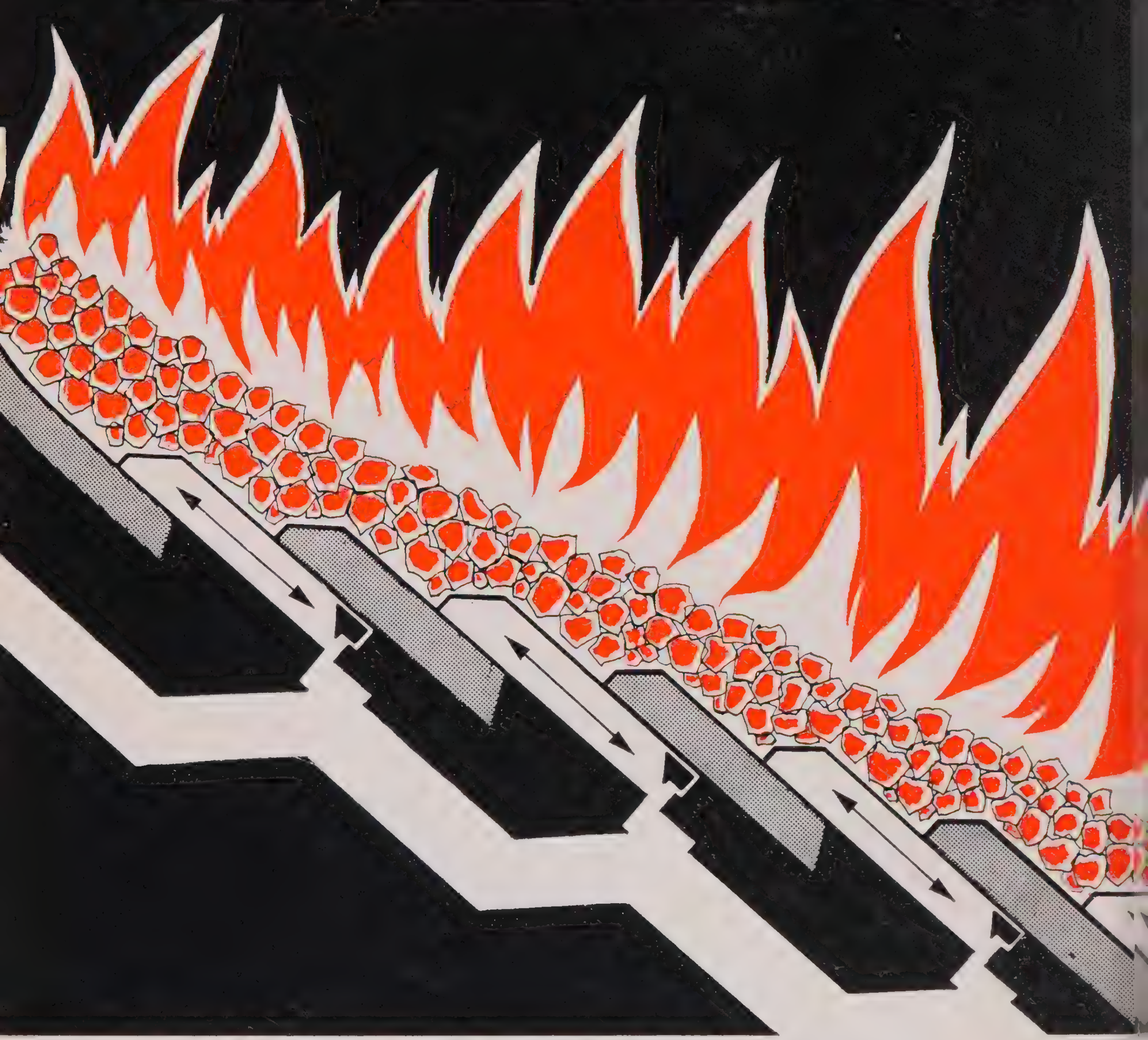

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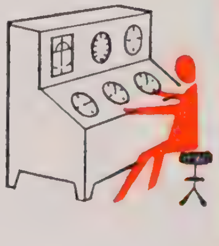

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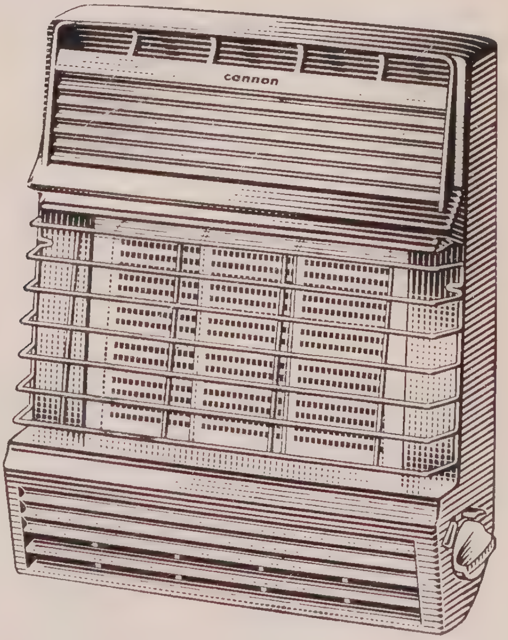

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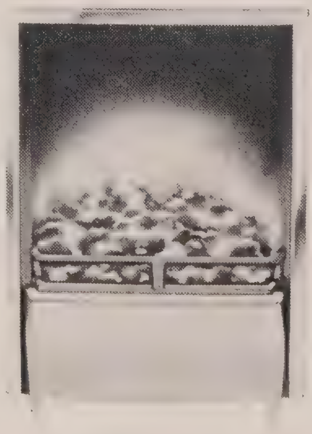

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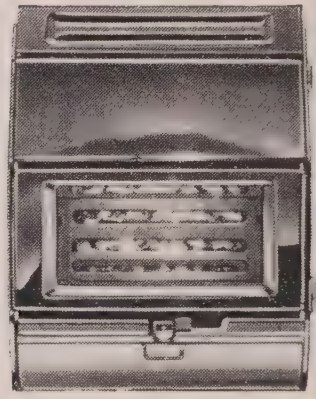

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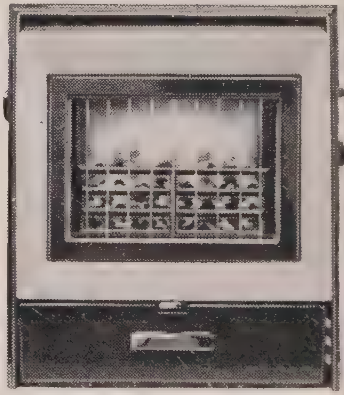

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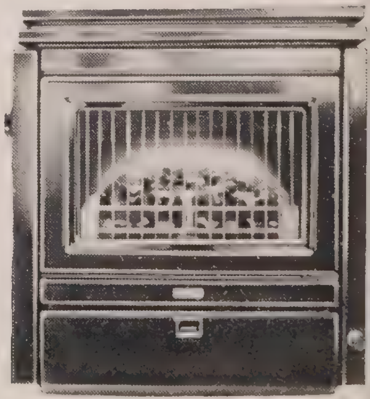

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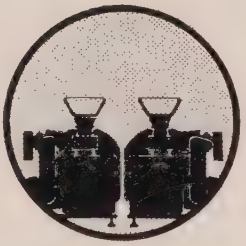

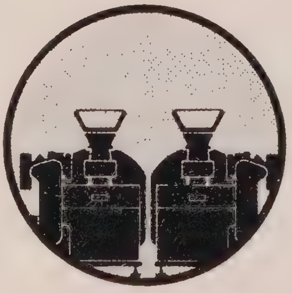

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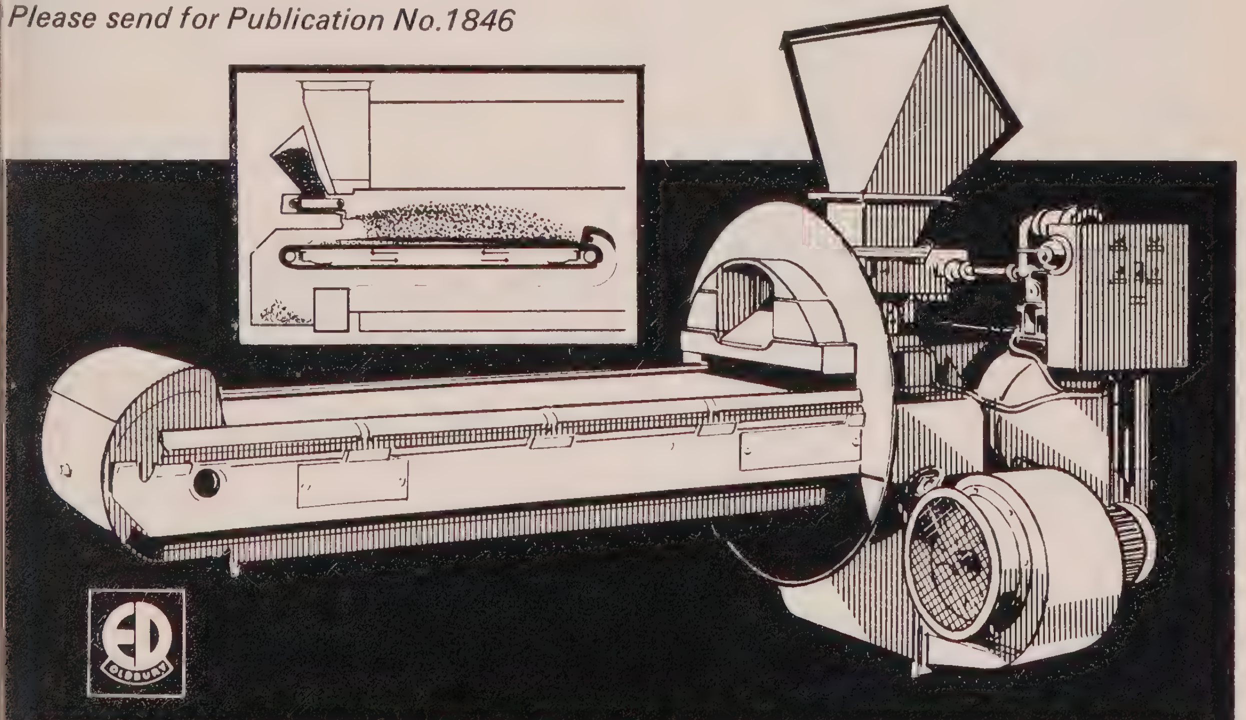

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*For full details of S.S.F.F. Services and literature apply to:*

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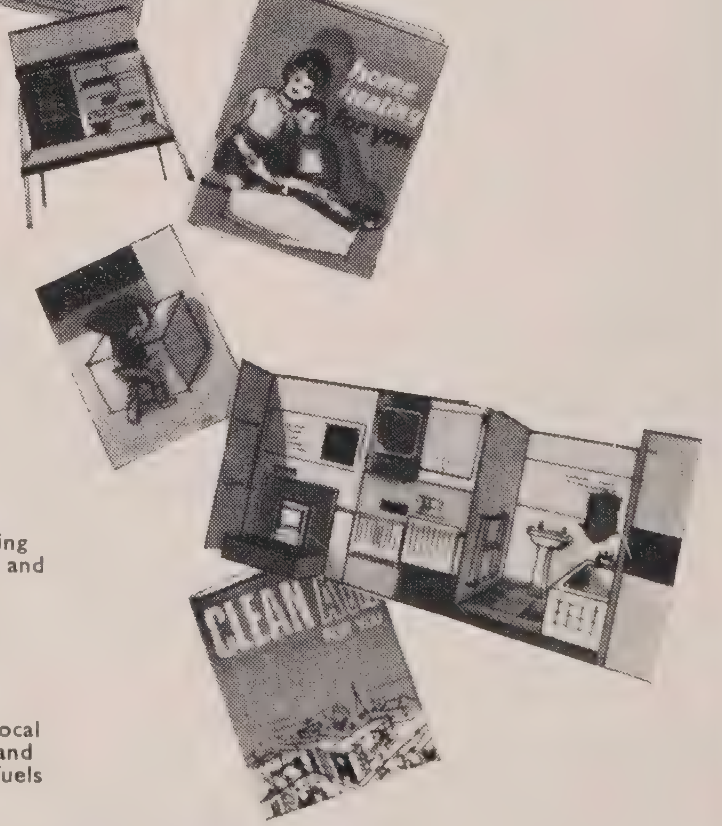

# SMOKELESS AIR

Vol. XXXIX No. 147 Autumn 1968

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: 01-242 5038 (Editorial and Advertising). Editor: Rear-Admiral P. G. Sharp; Assistant Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SMOKELESS AIR only 12s. per annum, post free.
SMOKELESS AIR is the official organ of the Society, but the views expressed in contributed articles are not necessarily endorsed by the Society. Abstraction and quotation of matter are permitted, except where stated, provided that due acknowledgements, including the name and address of the Society, are made. Technical articles of full page length, or over, in SMOKELESS AIR are indexed in British Technology Index.

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*Ships, towers, domes, theatres and temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air.*

# SMOKELESS AIR

## The New Bill

At 3.16 p.m. on Thursday, 25 July, Lord Beswick rose in the House of Lords and said "My Lords, I have it in command from Her Majesty the Queen, to acquaint the House that Her Majesty, having been informed of the purport of the Clean Air Bill, has consented to place Her interest so far as it is concerned on behalf of the Crown, at the disposal of Parliament for the purposes of the Bill".

Watching the progress of the passage of Mr. Robert Maxwell's Bill through both Houses of Parliament has been an interesting, and at times frustrating, experience. The pressure of work on both Houses has been severe, and at one time it seemed, as the 26 July approached, that the Bill might not be completed this Session. As was reported in our last issue, the Bill was given its third reading in the Commons on 10 May. It was read a third time in the Lords on 25 July and was returned to the Commons. Unfortunately, it was not dealt with before the House rose for the summer recess on 26 July.

The important point is, however, that the present session of Parliament is not yet over, and so there is little reason to fear that the Bill will have to start its whole passage all over again in the next Session.

The House re-assembles on 14 October for a further two weeks or so of the present Session. It is confidently expected that the Bill will be dealt with in that period and become law soon afterwards.

## Finances

Your retiring editor began his last editorial notes on what he described as "a question as old as the Society itself—the state of its finances". It is the happy lot of your new editor to report that the special appeal to our larger subscribers for substantial lifts in their contributions has met with a very generous response. It is also encouraging to report that there are signs of activity in the Divisions to obtain new members, not without success. Recruiting of this sort always takes time, but it is to be hoped that the impetus can be maintained and that the campaign will bear further fruit.

# Gas—and the Bacton Chimney

The Gas Council have very recently issued two booklets, one on the Gas Cycle Hydrogenator, and one on the Desulphurization Process.

The gas recycle hydrogenator (GRH) was developed by the Gas Council at their Midlands Research Station at Solihull for the non-catalytic hydrogenation of hydrocarbon feedstocks. Gases of calorific value up to 1,050 Btu/ft.$^3$ can be produced from a hydrogen-rich gas and a vaporizable hydrocarbon feedstock in an adiabatic reactor. The rich gas produced from this process can be used in a number of ways—as a fuel gas, as a natural gas substitute, to enrich a lean gas, or as a feedstock for a steam/hydrocarbon reformer, thereby providing the hydrogenating gas. In April 1968 there were 21 of these plants actually operating or under construction in this country. The Gas Council claims that these plants, which are of low capital cost, have a thermal efficiency of over 95%, with a high-output and turndown.

What is probably of more interest to this Society, however, are the 23 desulphurization process plants which reduce the sulphur content of petroleum products, ranging from LPG to kerosene, to less than 0·2 ppm by weight, by the catalytic conversion of the sulphur compounds to hydrogen sulphide followed by the absorption of the hydrogen sulphide on iron oxide. It is significant, however, that no mention is made of the desulphurization of the "sour" natural gas obtained from the Hewett Field in the North Sea and which will be brought ashore at Bacton in Norfolk.

On page 25 we publish a paper on "North Sea Gas and the Consumer" presented by Mr. A. Campbell to the Scottish Clean Air Conference in May, and this gives a very good survey of the discovery of North Sea gas, the advantages to be obtained from it and some of the plans for its distribution. But until reports were seen in the national press about the "Bacton Chimney", it was not generally realized that some of the gas to be brought ashore would require desulphurization before it can be used and distributed.

In 1967 the Minister of Housing and Local Government gave planning permission for the reception and processing of gas at the Bacton site so far as it might be necessary to render the gas suitable for transmission through the Gas Council's mains. This decision drew no distinction between "sweet" and "sour" gas. The only reservation in regard to "sour" gas, was the exclusion from the permission of any consent for a chimney. This meant that a chimney could not be erected without a specific planning permission granted either by the planning authority or on appeal by the Minister. The Minister asked that, if sulphur extraction were necessary, consideration should be given to alternative methods.

Accordingly, a public meeting to inquire into this was held in the village hall at Bacton on 24 and 25 June. In spite of the most inclement weather, the hall was packed to capacity with an audience of about 130 representing local residents in this part of Norfolk and their interests. Phillip's Petroleum were there in force with a team of about 15 experts headed by Mr. Norman Leslie, Managing Director of Petrofina, and Dr. Phil Kaiser, Managing Director of Exploration Production Operation, U.K.

A representative of the National Society for Clean Air was also present as an observer, and has reported on the meeting.

The Meeting was chaired by Mr. J. de Carle Smith, Chairman of the Norfolk County Planning Committee who, of course, were also present. The Chairman opened the proceedings with a brief statement regarding the purpose of the present meeting which was to get the fullest information possible for the Committee about the Phillips proposals for the plant to treat the "sour" natural gas from Hewett Field.

Phillips applied for planning permission for a development of a process involving the use of Claus Kilns and a 125-foot chimney to discharge residual gases. Up to 94% of impurities would be removed by process; the rest incinerated and removed by chimney. The company's spokesmen at the meeting gave assurances that there would be no black smoke, soot, particulate matter or smell from the plant and that the ground concentration of $SO_2$ would not harm plants, trees, crops or human beings.

Mr. Rice, of Messrs. Kremer and Warner, a consultant retained by Norfolk Council for an independent opinion, gave the meeting the following technical details regarding the proposed installation:

The MEA Claus Kiln would remove up to 94% of hydrogen sulphide and recover 6–7 tons of pure sulphur per day. The maximum emission of $SO_2$ would be 3 tons a day, 2·4 tons under normal circumstances, and 0·3 tons minimum. The concentration of gas issuing from the stack would be 1¼ million parts per hundred million parts. Maximum instantaneous concentrations at ground level: 17 parts per hundred million, with average concentrations about 1/50th of that figure. Mr. Rice said that he could not recommend other methods of disposing of hydrogen sulphide and that there would be no deleterious effects on the environment with the proposed plant.

Dr. Donald Hunter, C.B.E., on behalf of the Phillips Petroleum Company made a statement on the health aspects of the proposed installation. He said that the amount of $SO_2$ emitted would be negligible. He made the point that there were no smoke control areas in the district and that therefore there was already more sulphur dioxide produced by existing domestic chimneys than the amount eventually emitted by the new plant. Why did they not, Dr. Hunter wished to know, implement the Clean Air Act? It was illogical for the residents to grumble under the circumstances. He also mentioned smoking as being more harmful to health, but the meeting received his remarks without much sympathy.

During the lunch interval, every member of the audience was provided with a document from Phillips Petroleum which was entitled "Background Information and Supporting Data". This technical document was then later explained to the audience with the aid of slides.

Speaking on behalf of the Company, Mr. S. Hamburger, an economist, said that sour gas in the Hewett Field represented a national asset worth £100 million and he did not think anyone could seriously argue that this could be ignored merely because of the possibility that in certain exceptional circumstances its treatment might, for a short period, have an adverse effect on the amenities of the district. The importance of the sulphur contained in the gas they would handle was completely negligible. There were frequent interruptions in the audience such as "why sour gas at all?" and the feelings of indignation ran very high throughout the meeting. A recurring worry expressed by many speakers from the general public and interested local organizations was that more natural "sour" gas might be found in the North Sea in future, so the proposed plant would be just the thin end of the wedge.

Dr. Mahler, Deputy Chief Alkali Inspector, stated that he was quite satisfied about the height of the chimney in view of the calculated concentrations. He thought Phillips had chosen the right methods and his opinion was a marriage of mathematics and experience.

Many questions were asked about agricultural plants. Experts replied that by the time any sulphur dioxide emitted from the chimney reached ground level, it would be far too diluted to have any effect on people, livestock, crops, plants, trees or buildings in the area.

In reply to a question from the Council for the Preservation of Rural England about the quantity of sulphur which would be taken away from the plant every day by road it was stated there would never be more than one tanker a day, but six to nine trucks of condensates would also be removed every day.

Mr. C. P. Kaiser, Manager of Phillip's Exploration and Production Operations in the U.K., said that the Company would install a monitoring system so that long before ground-level concentrations reached a danger level the production in the plant could be reduced and the necessary steps taken to ensure that there would be no adverse effect on the area.

On the second day of the meeting there were numerous questions from the general public, all of whom expressed great anxiety about the likely loss of amenities in Bacton and the adverse effect on the holiday trade in the area, and on agriculture—this being a part of England with the highest yield per acre.

The main feature of the day was the refusal by the managing director of Petrofina (G.B.) Ltd., to enter into any legal agreement to compensate villagers for damage to property or health claimed to be caused by burning of sulphur. There was no question of any such damage being caused, he said, but if it could be proved that anything his Company did had caused damage they would consider the question of compensation.

Before the meeting ended at 4 p.m. on 25 June, a petition signed by more than 15,000 people was handed in, urging the Planning Committee to refuse planning permission until a public inquiry had been held.

Early in July, the Norfolk County Council decided to recommend that the Smallburgh Rural District Council Planning Committee should accept the plan with the stipulation that the chimney to be built by Phillips Petroleum should be 175 feet high instead of the original 125 feet. The effect of the extra 50 feet would reduce the ground level pollution of sulphur dioxide by as much as 50%.

It was announced on 23 July that the Smallburgh R.D.C. had approved the erection of the plant and the 175 foot chimney. The chimney however, is not to be erected until details of design and construction have been submitted and approved by the local planning authority. The emission of sulphur dioxide from the stack is to be limited to the equivalent of 24 tons per day. Infrequent emissions of limited duration, at a rate not exceeding the equivalent of 3 tons per day, because of breakdown or during the starting up of the sulphur recovery plant, will not be regarded as a breach of this condition. Further, no gas containing sulphur is to be treated on the site until monitoring systems for measuring sulphur dioxide emissions from the plant and ground level concentrations of the gas have been established on the site.

And as the last proviso it has been stipulated that if the rate of emission exceeds that stated above or the ground level concentration of sulphur dioxide exceeds the limits set in the approved scheme, then the local authority may require that the work of the plant should be halted or reduced as necessary to comply with the limits of emission stated.

# Live Steam Again?

It is perhaps ironic that at a time when the last steam locomotive has made its last run on our railway system, thoughts in America are turning to the steam car. From the point of view of clean air, the change from steam to diesel and electricity cannot but be welcomed wholeheartedly. But to some, and your editor is one, the passing of the steam locomotive is not without its sadness; somehow the steam engine, rather like a ship, had a personality of its own. The same can hardly be said of diesel and electric locomotives.

But perhaps the steam addict may yet find a new love in a steam car. Sixty years after the hey-day of the Stanley Steamer, steam-powered cars glided round Washington, D.C. recently. The cars were in Washington in connection with the hearing of the Senate Sub-Committee on Air and Water Pollution. The supporters of the modern steam car claim that it is competitive with I.C.E. car in terms of acceleration, smoothness, fuel consumption, power-to-weight ratio and operating range. And the use of the steam engine would reduce the emission of hydrocarbons, carbon monoxide and oxides of nitrogen drastically below the standard set in America for 1970. Nevertheless, both General Motors and the Ford Motor Co. contended at the hearing that a cleaner internal combustion engine could be made to meet the U.S. Government's anti-pollution standards long before a steam car could be designed and in production. Being inherently more complex than internal combustion engines, it was stated that they would be more expensive to manufacture. Against this was the view that mass production of the steam car would bring down its price, and it was acknowledged that anti-pollution modifications on the I.C.E. might wipe out the advantages now claimed for it.

Of course, the electric car is also a contender as a replacement for the I.C.E. and the electric car produces no pollution; but it is limited in speed and present-day batteries need frequent recharging. On balance, it seemed that the administration was more impressed with the steam car, but time alone will tell what the answer will be.

As steam disappears from the railway, shall we see it appearing on the motorway?

# Arnold Marsh Presentation Fund

At the Annual General Meeting, Sir John Charrington, your President, presented Mr. Arnold Marsh with a cheque for £250. Since then, subscriptions have continued to come in, one of the more recent ones coming all the way from Japan, and it has been possible to send a further £181 to Mr. Marsh. The General Purposes and Finance Committee recently decided that the fund should remain open until 31 October, and so if you have not yet contributed and wish to do so it is not too late. Subscriptions should be sent to the Society's Honorary Auditors, Messrs. Geo. Little, Sebire & Co., Adelaide House, London Bridge, London, E.C.4.

*The Passing of Steam*

*The Flying Scotsman leaving King's Cross at 10 a.m. on 1 May 1968. Sunday, 11 August 1968 marked the official end of all steam operation by British Rail*

*Photo: Fox Photos Ltd.*

# Working Party on Air Pollution for Europe?

Mr. Robert Maxwell, M.P., the sponsor for the new Clean Air Bill, recently told members of the Air Pollution Committee for North Buckinghamshire, of which he is the Chairman, that he intended inviting the Council of Europe to set up a Working Party on air pollution. Mr. Maxwell who is Vice-Chairman of the Committee of Science and Technology for the Council of Europe, said that such a Working Party could prevent duplication of research into air pollution among the 18 countries represented on the Council of Europe. He added "I have so far not agreed to the setting up of a national committee, on the grounds that we first of all want to tackle our problems here and see what we can learn from them. This air pollution problem is likely to be with us for a long time and we must do our homework".

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# Training of Local Authority Staffs in Grit, Dust and Fume Measurement

by F. Reynolds, F.R.S.H., M.A.P.H.I., M.Inst.F.,

*Chief Air Pollution and Noise Abatement Inspector, City of Birmingham*

## Few Trained Officers

In some respects it is perhaps fortunate that the Commons were unable to debate the Lords' Amendments to the Clean Air Bill. It can only be hoped that it will pass its remaining short stages in the two weeks available between re-assembly on the 14 October, and the prorogation of the present Parliamentary session. But the three months delay will provide Local Authorities with a breathing space in which to consider how and where they might organize training facilities for their Inspectors in the use of Grit and Dust and Fume measuring equipment.

Very few, if any, Public Health Inspectors outside the West Midlands conurbation are yet trained or experienced in the use of stack solids sampling equipment to the proficiency which is expected of them in the Bill or in The Clean Air (Measurement of Grit and Dust) Regulations 1968. The Regulations prescribe the administrative procedure for applying S.7.(2) of the 1956 Act to a furnace. This section, which relates to the measurement of grit and dust from certain solid fuel fired plant of medium/large size, is to be replaced by S.5. of the Bill thus reducing the present lower limit from one ton/hour to 100 lbs/hour (or an equivalent in liquid or gaseous matter) the "fuel" consumption at which the Local Authority can require by Notice, grit, dust *and fume* measurements to be made. The Bill also provides for an Industrialist to serve a counter-notice requiring the Local Authority to carry out these measurements. The vast majority of installations are in the lower range subject to possible counter-notice action.

## High Cost of Measurements

It has been well emphasized in the Report of the Working Party on Grit and Dust Emissions and in the Ministry publication "Grit and Dust" that the measurement of stack solids is both time consuming and costly. N.I.F.E.S. for instance require two to three days to do a full grit and dust survey of a relatively small plant, including site survey, equipment preparation, actual testing, calculation of results and preparation of the report. Their fee for this work, whether for an industrial client or a Local Authority would be £70 to £100 and if any problems were encountered, the fee could be substantially higher. The quoted figures do not include the cost of providing the sampling points, scaffolding and platforms which would in any case be the responsibility of the industrialist.

There is no power proposed in the Bill for the Local Authority to recharge any of the cost of carrying out the measurements after being served with a counter-notice, and it is possible that some Authorities will be reluctant to risk the service of a Notice in respect of plant in this size range, since this will almost inevitably result in them having to bear the cost of the work. The effect could be the opposite to what is intended, and may result in virtual inactivity in the measurement of grit, dust and fume emissions from the very large number of furnaces in this range.

Where a Local Authority might object to paying the full fees of N.I.F.E.S. or other consultants for this work, they would be more inclined to risk the service of a Notice if their staff were capable of assisting a N.I.F.E.S. engineer with the test, or preferably, of carrying out the test entirely themselves with their own equipment. In any event, it will be the responsibility of the Public Health Inspector or an assistant to ensure that the sample is fairly taken and that the results of the test are as accurate as can be obtained in the circumstances. Consequently, adequate training of responsible staff is a fundamental necessity before a Local Authority embark on a policy of enforcement—whether by formal or informal action.

### Recent West Midlands Training Course

A training course has recently been held in the West Midlands for eight air pollution specialists from seven Local Authorities (two from Birmingham and one each from Dudley, Halesowen, Walsall, Warley, West Bromwich and Wolverhampton). The course was initially arranged by my predecessor, Mr. S. C. Beaumont, in conjunction with N.I.F.E.S., and we were fortunate later to obtain the additional co-operation of Shell-Mex and B.P. Ltd., and the National Coal Board so that a wide range of stack solids sampling equipment was explained, demonstrated and discussed in detail.

The Fee for the N.I.F.E.S. part of the course, which in this case was the pioneer course involving considerable preparatory work, was £65 12s. 6d for each officer; but it is anticipated that the cost of future courses will be £36 15s.0d. if 12 trainees are involved and £47 if eight trainees are involved. It is possible that some or all of the course fees may be recoverable from the Local Government Training Board. There was no charge by either Shell-Mex and B.P. Ltd. or the National Coal Board.

The original intention was to arrange the N.I.F.E.S. course into a series of lectures and demonstrations as follows:—

**Day One**—Revision in fundamentals of fluid flow and use of measuring instruments for temperature, pressure and velocity of gases.

Demonstration of B.C.U.R.A. grit and dust sampling apparatus, i.e. component parts, assembly and usage.

**Day Two**—Demonstration in "standardizing". Packing and weighing filters—each trainee to prepare his own collecting pots and filters. Familiarizing routine with B.C.U.R.A. equipment.

**Day Three**—Site test on a selected coal-fired boiler plant.

**Day Four**—Weighing of pots and filters and sieving samples into component fractions.

**Day Five**—Explanation of calculating procedure followed by calculations from results obtained on site.

**Day Six**—Calculations continued and results reported.

### Value of Practical Training

In practice, the formality of the lecture series was quickly dispensed with after the first morning. The revision of fluid flow etc., was necessary, but the trainees found that the actual handling of the equipment, and the explanation of the component parts, assembly and usage were most valuable when they later came to make the actual site measurements.

The site work itself made the trainees aware of the problems not only of using B.C.U.R.A. equipment, but also of sampling stack solids generally. The underlying principles of fluid flow and the theory of stack solids measurement by iso-kinetic sampling are complex but have been nicely simplified in B.S.3405. Sampling in practice, with all types of equipment, is, however, fraught with snags and difficulties which can be resolved only by an operator who has experience of handling the particular equipment over a period of time and has been able to benefit from the mistakes which he has made.

Consequently, the N.I.F.E.S. course was quickly re-arranged to include several works visits to view the problems encountered in selecting suitable sampling positions in ducts and stacks before and after grit and dust arresting equipment. Because the West Midlands has by far the largest concentration of cupolas in the country, two of the visits were to large foundries whilst one other was to a very large Municipal Refuse Destructor to see the problems of inserting the sampling holes in a brick chimney of 6 feet internal diameter with 3 feet thick brickwork at the chosen sampling point.

The general comments of the trainees at the end of the N.I.F.E.S. course were:—

(1) The informality of the lectures and the amount of free discussion in respect of both practical and legal aspects of sampling was appreciated and was thought to be of value both to the N.I.F.E.S. engineers and to the trainees.

(2) The various printed notes and documents should have been circulated prior to the commencement of the course.

(3) Additional time created by prior-circulation of lecture notes could be used with advantage for additional practical work, particularly external sampling on small diameter stacks, and additional works visits to determine correct sampling points.

These comments indicate the importance of a general understanding of all the problems involved and particularly the value of practical visits and actual site work in the training of Local Authority Officers.

The subsequent Shell-Mex and N.C.B. lectures were necessarily shorter and more theoretical, but were none the less essential.

### Measurement of Solids from Oil Firing

At the Regional Offices of Shell-Mex and B.P. Ltd., the Senior Fuel Development Engineer (Mr. A. W. Rooney) and his staff explained the significance of stack solids from oil-fired plant; related the proposed emission standards to those found in practice from various types of burner and emphasized the importance of designing the burner to match the environment in which the fuel oil is to be burned, in order to minimize the emission of solids.

Both the Shell Carbon Determination apparatus and the B.P. Stack Solids equipment were exhibited and fully described by Mr. Rooney and his staff. The first is used to determine the concentration of carbon solids in flue gases by means of iso-kinetic sampling and removal of the solids by a silica wool plug, followed by oxidation of the solids in a furnace and volumetric measurement of the resultant gases; no chemical balance being necessary. The second has been developed for iso-kinetic sampling and removal of the solids in a silica wool filter by methods similar to those used for B.C.U.R.A. equipment; the weight of the solids in this case is determined by "before and after" measurements on a chemical balance.

### Development work to reduce Stack Solids

Mr. Rooney explained that this equipment could be purchased from the manufacturers, but, although fully transportable for on site testing, its use has so far been restricted to assisting the various oil burner manufacturers to develop equipment capable of operating with a total solids emission not greater than 0·2 per cent of the fuel oil burned at 12 per cent $CO_2$. This is a very stringent requirement and is well within the proposed official standard.

Additional equipment including the familiar Shell Smoke Meter, suction pyrometers and Foster potentiometers were exhibited, demonstrated and discussed.

### N.C.B. Equipment

During a later meeting at the Dudley District Sales Office of the N.C.B., Mr. R. Whitehouse and Mr. D. Crowther explained that the Board's policy in relation to grit and dust measurement had not been fully established, but it seemed possible that these facilities might be provided as a service to their customers.

Mr. Crowther then summarized the problems of stack solids emissions and gave details of typical results obtained from numerous types of coal-fired installations. He made it quite clear that many types of existing plant would almost certainly give more than the envisaged maximum emission, but conversely it would be possible for well maintained plant equipped with moderately efficient arresters to operate well within the proposed standards.

The N.C.B. British Standard stack solids sampling equipment was exhibited and described. This equipment has the advantage of requiring only two-inch holes to be drilled into the stack, but suffers from the disadvantage of weight; one part of the assembly weighs over 150 lbs.

### Development of N.C.B. Equipment

Quite recently the Board's fuel technologists have developed simpler and lighter sampling equipment based on the B.C.U.R.A. method, in this case not incorporating a backing filter; but Mr. Crowther's attention was drawn to the Clean Air Bill's probable requirement that grit, dust *and fumes* must be measured and it was suggested that a backing filter would be essential. (Following this lecture I have had an additional meeting with N.C.B. Officers to discuss this point further. The Board has now agreed to carry out development work on the lines suggested but still intend the equipment to retain the big advantage of a two-inch sampling hole).

### Unique Team

The opportunity offered to the eight specialist inspectors to see, handle and discuss the various types of equipment has provided the West Midlands with a unique team of Local Authority Air Pollution specialists whose knowledge and ability in grit and dust measurement cannot yet be matched by any other area of the country. It is unlikely however that these officers will be really competent or experienced with the use of this equipment unless and until their Authorities decide to implement the provisions of the Regulations in the way provided for in the Clean Air Bill, and until each Authority decides whether it is to purchase and use the necessary equipment itself or to ask consultants to do the work for them, suitably assisted by a trained officer.

### Cost of Measuring Equipment and Ancillaries

The cost of a standard set of B.C.U.R.A. equipment from Airflow Developments Ltd., is £356 and to this can be added a further £600 for necessary spares and also for ancillary equipment such as a filter drying unit, balance, dessicator, electric cable, safety harness and clothing for working at a height or in poor weather conditions, pyrometers and a potentiometer, etc. If the Local Authority has a convenient Public Analyst, some of this equipment will already be available in his laboratory, but, even then, the total cost of necessary equipment will be about £750 if this work is not to be carried out in an amateurish fashion with resultant doubts as to the accuracy of the results obtained.

### Sampling officers must be insured

Local Authority Members will no doubt realize that the measurement of stack solids can be arduous, difficult and sometimes dangerous. There is no question in most cases of simply walking up to a chimney, inserting the sampling probe and taking a sample.

Since it is usually desired to ascertain the weight of solids discharged to atmosphere in unit time, the ideal sampling position would be at, or close to, the chimney outlet. Such a position is often impracticable, and some other position where the gas flow is vertical and where the distribution of solids can be expected to be reasonably uniform must be selected. It is sometimes possible to arrange the sampling position in a horizontal flue, but this is not as satisfactory as in a chimney or a vertical section of flue. To obtain uniformity of distribution of solids across the sampling plane, the sampling point must not be too close to bends or junctions.

In the majority of installations including comparatively small units, the furnace flue connection to the stack is at a height of 10 feet or more from ground level. The sampling point should be some distance above the flue connection and access to it must be by ladder, scaffolding and a working platform of adequate size, which in some cases—cupolas for example—may be at a height of 100 feet or more. Even in an "easy" position, the sampling platform will be at a height of 20 feet to 30 feet for many installations.

There is no point in training an officer who, because of his ill-health or physical condition or who suffers from hypsophobia or vertigo, is unable or unwilling to climb to the sampling platform; and for the sake of those officers who are trained, the Local Authority must ensure that they have a good insurance policy!

### Limited Additional Training Facilities

At the date of writing this article (mid-August) no training courses had been arranged, or were currently envisaged, in many Regions where one would normally expect the Local Authorities to be alive to the problem of dust and grit emissions. These areas include Bristol, Cardiff, Manchester, Liverpool and

Nottingham. In Leeds and Newcastle preliminary discussions have been held with N.I.F.E.S., but no firm arrangements have yet been made; while in Sheffield, arrangements are now in hand for the Department of Chemical Engineering and Fuel Technology of the University of Sheffield to carry out a number of tests in conjunction with the specialist staff of the Sheffield and District Clean Air Committee who will simultaneously undergo practical training.

In Warwickshire, it seems probable that the Warwickshire Clean Air Council will consider purchasing the necessary equipment on behalf of its 19 constituent authorities, and that the actual measurement will be carried out by Local Authority staff assisted by the Council's appointed Analyst, who is also the Director of the City of Coventry Scientific Laboratory. No specific training has yet been arranged.

In the South East, arrangements have been made for a course of theoretical and practical instruction which would appear to be ideal. The intention is that the trainees should spend two days at the Tottenham Technical College for theoretical instruction, and two days at B.C.U.R.A. Leatherhead, for instruction in the practical use of their equipment .However, I have doubts if four days will be really adequate and I feel that it might also be advisable to consider an approach to Shell-Mex and B.P. Ltd., and to the N.C.B., for additional instruction in relation to their equipment.

### Apathy or "Wait and See"

The apparent apathy to the need for adequate training facilities is hard to understand, but possibly the high cost of the courses may be an excuse for inactivity. This is not, however, a valid reason for Local Authorities failing to accept what will undoubtedly be their responsibility in the very near future. Air Pollution specialists have long been asking for more power to their elbow, but legislation without adequate knowledge of the technical problems involved in its enforcement is a dangerous instrument. There is no room for a policy of "wait and see".

## DUSSELDORF 14–16 OCTOBER 1969

### Theme of Congress Announced

The V.D.I. Kommission Reinhaltung der Luft have announced that the title of the Congress to be held in October next year will be "Progress and Success in Cleaning the Air" (Fortschritte und Erfolge der Luftreinhaltung).

As announced in the last issue of *Smokeless Air*, the Society is organizing a Joint Venture Stand at the Exhibition being held with the Congress. A meeting of intending exhibitors is planned at the Board of Trade Building, Victoria Street, London, in October when the site and design details will be discussed.

# NORTH SEA GAS AND THE CONSUMER

Paper by A. Campbell, C. Eng., A.M.I.Gas E., Group Manager of the East Central Group, Scottish Gas Board at the Annual Conference of the Scottish Division in Hawick, 23 and 24 May 1961.

## NORTH SEA GAS—ITS AVAILABILITY

While the possibility of gas and oil being present in the North Sea area has been the subject of speculation for many years, early experience in the use of natural gas was obtained in the United Kingdom from the importation of liquid natural gas.

During the 1950s, successful trial transportation of liquid methane by sea from the American continent led the way to the importation of liquid natural gas from Algeria in purpose-built refrigerated ships, the temperature during transportation being—258°F. (1/600th of its gaseous volume).

The liquid methane is discharged and stored at Canvey Island and is then, in a gaseous form, distributed through the methane grid which serves eight Area Gas Boards. The principal use of this natural gas has been to enrich manufactured gas.

Approximately 10 per cent of the total gas requirement for the United Kingdom has, during recent years, been supplied from this source.

Following the striking of a large gas reserve at Slochteren in Holland in 1959 and relatively small finds on the east coast of England, the search for gas and oil in the North Sea area commenced.

After the Continental Shelf Act was passed in 1964, licences were granted for exploration and production drilling in the United Kingdom part of the North Sea. By comparison with experience in other parts of the world the discovery and development of the present North Sea fields has been very fast.

The first major strike of natural gas was the discovery by British Petroleum late in 1965 of the West Sole field from which the first regular supplies were received by the Gas Council at its Easington terminal in July, 1967. Of the numerous fields discovered to date, four are of major importance and the largest, the Leman Bank field, is expected to be in production during the summer of 1968.

Estimates of reserves have to be constantly revised as more information becomes available but assessments relating to the four major fields indicate that an average daily flow of 3,000 million cubic feet a day could be sustained for 20 to 30 years. This is nearly three times the present output of the gas industry. It is confidently stated that in the early 1970s 4,000 million cubic feet per day will be available and this constitutes only a relatively small section of the North Sea territory.

Some 10 per cent of the nation's gas requirements are currently being drawn from British Petroleum's West Sole field through the Easington terminal and you may have noted the recent 25-year contract which was made with the Phillips Group for the purchase of natural gas from the Group's portion of the Hewett field.

The price to be paid by the Gas Council, based on a 60 per cent load factor, is 2·87 pence per therm.

The existing methane main which stretches from Canvey Island to Leeds in the north, is being used as the basic distribution system for the transmission of North Sea gas. Extensions are, of course, currently planned and in existence, connecting this backbone main to the coast and taking it into the four Area Boards which have not, until now, been connected, that is South-west, Wales, Northern and Scotland.

## NORTH SEA GAS—ITS CHARACTERISTICS

The natural gas found in the North Sea in the British concessions is of good quality and better than that from the Dutch finds. It is a rich gas of a calorific value roughly twice that of the present town's gas and with the high pressure available, something in the order of 1,000 lbs. per square inch, it can be conveyed over long distances without power compression costs. The constituents of the gas are very different from those of town's gas which contains up to 50 per cent hydrogen, while North Sea gas consists almost entirely of methane. This causes a marked difference in combustion characteristics as hydrogen has a very high flame speed whereas methane burns relatively slowly.

It is important to note that due to the absence of carbon monoxide in North Sea gas, it is non-toxic.

The property of natural gas which can make the biggest impact on Clean Air is that the bulk of it is, for all practical purposes, sulphur free. It is reported as containing 0·0002 lb. of sulphur per therm and that most of this comes from the odorant used to give natural gas the characteristic town gas smell. The relative absence of sulphur will make a real contribution to the economics of the maintenance of appliances and will reduce the inconvenience to the consumer and to the public at large caused by the presence of sulphur compounds in the products of combustion.

There is no doubt in my mind that North Sea gas, this new, indigenous smokeless and sulphur free fuel must play an increasing part in furthering the cause of Clean Air.

## NORTH SEA GAS—ITS SALE

Arrangements are now being made for the introduction of North Sea gas into Scotland in 1970. An extension of the natural gas pipeline from Newcastle is planned to cross into Scotland in the Coldstream area and will proceed northwards to a point south of Edinburgh where it will swing westwards towards Glasgow.

While it is recognized that natural gas should be used at the earliest possible date in the premium markets to obtain the highest rate of return, it is obvious that an early load is presented in the use of natural gas as a feed stock to produce town's gas in Reforming Plants and thereby displacing imported feed stocks.

In order to attain a rapid build up of the market, considerable quantities of the initial supply may go to the bulk Industrial market.

It is not, unfortunately, just a simple case of natural gas coming in from the south-east and progressively converting geographically east to west or south to north with a total disregard to its effect upon capital plant and potential markets. The strategy of the introduction programme is therefore complex.

Having regard to the many alternative and, in some cases, complementary approaches, the Board decided that it would be worth while to engage experience in conversion and accordingly have appointed H.G.S., a partnership of Messrs. Humphreys and Glasgow Limited, London and Sofregaz, Paris, as Consultants to advise during planning.

Already the demand for gas in Britain is increasing at a rate approaching 10% per annum and the forecast for the next five years is of increases ranging from 9 to 16%.

It is well known that in those countries that have been fortunate enough to find supplies of natural gas there have been enormous increases in public demand for gas for many purposes. In the U.S.A., for example, the demand for natural gas has increased by 15 times in the past 20 years.

The Chairman of the Gas Council, Sir Henry Jones, has recently stated "We have set ourselves a target of doubling sales of gas in the next three or four years and quadrupling this by mid-1970s. We cannot hope to meet this target unless our prices, already competitive, show a substantial relative improvement over the next few years. This cold economic fact alone should give customers an assurance of our determination to get our prices down". Against this background, Sir Henry leads the present price negotiations from the Gas Council point of view and I understand that Shell and Esso have everything ready to start delivering gas from their large Leman Bank field in June except a sales contract. You must, therefore, recognize the vital character of these negotiations in determining the contribution which North Sea gas will make to the national economy and to the eventual price to the consumer.

## NORTH SEA GAS—ITS USE

Because the British Gas Industry is very advanced technically and the most sophisticated town gas industry in the world, both in respect of gas production and appliance design and performance, to change to natural gas presents special problems. The problems arise from the need to convert the whole appliance population of the United Kingdom so that this new high quality fuel can be burned efficiently. At present, approximately 44,000 consumers have had their appliances converted to use natural gas. These consumers are spread over five English Gas Boards and include the pilot exercise carried out during 1966 when 7,000 consumers on Canvey Island were converted by the North Thames Gas Board to use imported natural gas.

In Scotland the period planned for the conversion of all domestic, commercial and industrial appliances and equipment is 6 to 10 years at an average rate of 100,000 consumers per year.

From the consumers' point of view the conversion operation may be split into three parts.

(1) Preliminary work which can be carried out well in advance of conversion and will be associated with alterations or replacements to existing governors, filters and meters. This could take place sometime during the year preceding the conversion date.

(2) Pre-conversion: To minimize the time taken on the actual day of conversion, pre-conversion will be carried out on appliance burners and other ancillary equipment. This may be scheduled to take place a few weeks prior to conversion day.

(3) Conversion: The final conversion of the appliance consisting of the replacement of injectors, the adjustment of pressures and regulation of burners.

It is planned that sectors of up to 7,000 consumers will be handled during a composite conversion operation.

A considerable amount of preliminary work will be carried out on the distribution mains feeding such a sector so that on conversion day towns gas can be shut off, the system purged and natural gas fed into the system. On the first day of the week that conversion is being carried out in a selected sector, all priority customers and priority appliances will be converted to use natural gas; and over a 4/5-day cycle all appliances in the sector will be converted and tested, the whole operation being carried out by a team of approximately 300 trained staff before the following week-end. Such an operation would be fully supported by a wide-scale publicity campaign through which consumers will be fully informed of the programme for their particular area.

In view of the need to secure availability of experienced labour, Messrs. William Press & Company Limited have been appointed by the Scottish Gas Board to deal with the first phase of conversion totalling around 300,000 consumers. A sample survey has been carried out of domestic appliances throughout Scotland with a view to determining the age and type of appliances and to assess the equipment necessary for conversion. It is reckoned that one in five of all cookers in use in Scotland is obsolete, that is, the appliance is more than 15 years out of production and can no longer be supported by a spare parts service.

All domestic appliances presently on sale are equipped with multi-gas burners and are suitable for easy conversion to natural gas conditions. It should be appreciated that the problem of conversion stems from the need to use an appliance efficiently on a new fuel for which it has not been designed. There is no problem in the design of new appliances to use the new fuel.

One immediate benefit deriving from the high quality of North Sea gas is that the whole distributing system immediately has a carrying capacity in therms twice that at present. Incorporated in the conversion of our systems is the need to increase appliance working pressures and this will also contribute to the increased carrying capacity of mains and services.

The estimated average cost of conversion is £30 per house, which means a total capital expenditure in the Scottish Gas Board for the conversion of appliances of £30 million. This expenditure will not fall as a direct charge on the consumer.

Natural gas has several forms and while the industry actively pursues the introduction of natural gas from the North Sea, there remains with us in Scotland the problem of the small isolated undertaking situated beyond the limits of economic integration. An interesting development is currently taking place in Thurso and Wick where the Scottish Gas Board, in order to meet increased demands for gas, have entered into an agreement with Calor Gas (Distributing) Company, Limited to provide a new and more economic gas supply. With the approval of the Minister of Power, gas production is being transferred from the traditional coal plants to liquid petroleum gas/air plants on the present works sites and consumers will receive a new gas through the existing distribution system. Appliances will be modified to use the new fuel.

Although the whole operation of change-over to North Sea gas would seem to be a mammoth and most complex task, it must be accepted that if the country and the consumer is to receive maximum benefit from this new indigenous fuel, every measure must be taken to develop its use in a rational and efficient way. After the effect of the initial capital expenditure is overcome, the real financial benefits must quickly be realized, together with the obvious benefits to the community and the environment from the increased use of a clean premium fuel.

# IN THE HOT SEAT

A very interesting discussion took place in the studio of "Radio Leeds" on Tuesday, 30 July, and in the 'hot seat' was Alderman Mrs. Cardno, Chairman of the Health and Welfare Committee of the City of Leeds. Putting her there was Mr. D. H. F. Smith, the director of a firm of woollen manufacturers and a member of the Leeds Junior Chamber of Commerce. Also taking part in the programme were James Goodfellow, Chief Public Health Inspector of Leeds, Mr. E. J. Winfield, retired Chief Public Health Inspector of Castleford, and a Leeds General Medical Practitioner.

Mr. Smith said that he would like to change the drab and dreary appearance of Leeds, because he was concerned with industry and employment of persons which he felt were prejudiced by atmospheric pollution. He also said that Leeds Corporation had moved too slowly in the field of smoke control because only a quarter of the houses in the city were covered by smoke control orders. He felt that lack of finance was the main reason why Leeds was so far behind, and he was also concerned about industrial smoke and vehicle pollution.

Alderman Mrs. Cardno replied to the charge by giving an assurance that the Leeds Health and Welfare Committee was most sympathetic to all these views, and she stated that they intended to adhere to the target date and see that all the dwelling-houses in Leeds would be under smoke control by 1975.

The General Practitioner entered the discussion to say that he agreed with Mr. Smith that Leeds had been very slow in the application of smoke control. He said that as Leeds had only got 25 per cent of its houses under clean air in 12 years, how could it do 75 per cent in the next six years?

Mr. Goodfellow said that it was not practicable to start making smoke control areas at the average rate and proceed steadily throughout the 18-year campaign. He said that 73 Smoke Control Orders had been made in the City to cover 48,942 houses, and work had started slowly and was accelerating year by year. This enabled the administrative machinery gradually to build-up and co-ordinate and keep in step with the increasing amount of work of adaptation. He felt that it would be possible to accelerate the rate so that all the dwelling-houses in Leeds could be covered by Smoke Control orders by 1975.

Mr. Rae Beatty, the Chairman of the "Hot Seat" programme asked for the group's views why a number of smaller authorities in the West Riding of Yorkshire had so far done nothing at all in regard to the making of Smoke Control orders. Replying to this point, Mr. Winfield said that he was in complete sympathy with the miners who were alarmed at the failing demand for coal, and who, he said, were 100 per cent against smoke control; and he also explained that they were concerned about the financial loss pertaining to the cessation of concessionary coal. Commenting on this point, Mr. Goodfellow said that he had every sympathy with the difficulties of miners' work. Of all the workmen in this country, none were more deserving of clean air above ground in their dwelling-houses and surroundings than miners who often had to breathe polluted and dust-laden air underground. He felt that the miners' opposition to smoke control was unfortunate because it had deprived them of the financial grants available and of the improved appliances that could be installed in their homes with consequent improved comfort and heating levels. He said that he could have understood miners who wanted smoke control, objecting to gas or electric appliances, and insisting on improved appliances for burning solid smokeless fuel; and he pointed out that when 20 cwts. of suitable coal was carbonized it only produced about 11½ cwts. of solid smokeless fuel, so that assuming the same heat level was required, smoke control with approved appliances burning solid smokeless fuel would, in fact, increase the demand for coal suitable for carbonization.

Alderman Mrs. Cardno came into the discussion at this point to say that she thought it was unfair to compare the smoke control performance of one city with that of another. She explained that Leeds had had a very large slum clearance programme and 30,000 slum houses burning raw coal had been demolished. She also explained that Leeds had 15,000 houses in improvement areas, where the houses were being given modern appliances for space heating, water heating and cooking which would also be smokeless under the improvement scheme. These also had to be taken into account when judging the smoke control performance.

Mr. Smith commented that he thought the Leeds Corporation did not fully realize to what extent all the citizens were clamouring for clean air, and moreover, he thought that the Leeds City Council would have to revise their financial allocations for smoke control area. Continuing, he said that he was concerned about sulphur dioxide in the atmosphere increasing; something would have to be done about this.

Mr. Goodfellow, commenting upon sulphur dioxide, stated that when an area of houses was placed under smoke control, a number of owners opted for solid smokeless fuel; and as approved appliances gave increased efficiency, this meant that less weight of fuel was used and so less sulphur was emitted. Other house owners opted for smokelessness by gas, and others by electricity; neither of these emitted any sulphur from the dwelling-house. In fact, when housing estates were placed under effective smoke control, there could be expected to be a measured reduction in the amount of sulphur dioxide in the atmosphere of up to 25 per cent.

Mr. Smith said he also thought something should be done about exhausts from road vehicles, particularly diesel engined vehicles.

Mr. Goodfellow replied that some diesel vehicles were still occasionally seen to emit smoke, which was unpleasant, and also introduced a safety hazard on the road. But it has not yet been shown that diesel smoke has any direct ill-effects on health. He thought the Motor Vehicles (Construction and Use) Regulations, 1963, already provided an adequate legal basis for the control of smoke from diesel engined vehicles.

Of the emissions from petrol-driven vehicles, the major component which could have an adverse effect on health was carbon monoxide. This was essentially a local problem. In confined and ill-ventilated places seriously high concentrations of carbon monoxide may be found.

Mr. Beatty asked what should be done about vehicles.

Mr. Goodfellow replied that he thought the Ministry of Transport should fix limits for carbon monoxide content of motor car exhaust gases; but in terms of relative priorities, air pollution from domestic sources was in far greater need of action to restrict it.

Alderman Mrs. Cardno then said that estimating the cost of expenditure on smoke control was very difficult; her committee fully realized the importance of clean air and was determined to push on with the making of domestic smoke control orders as fast as possible.

The discussion ended with the general practitioner and Mr. Smith both urging Leeds Corporation to make the necessary finance available so that Leeds could be smokeless by the target date.

# Two New Clean Air Films

**New Air for New York:** Colour: 13½ Minutes

The Con Edison Company generate all the electrical power consumed in Metropolitan New York. The Company have now produced a film which emphasizes the pollution problems inherent in this enormous enterprise and shows how the daily requirements of power are increasing to such an extent that New Yorkers can require more electric power in one day than a medium sized city would use in a month.

Superbly photographed, the film sketches in swift dramatic terms the problems and remedies and tells of the continuing air pollution abatement programme of the Company. The nuclear powered generating station at Indian Point is described in detail and the film concludes by suggesting that the answer to air pollution from power stations is to abandon the use of fossil fuels and change over to nuclear power.

**Horsepower and Hydrocarbons:** Colour: 22 Minutes

The California Motor Vehicle Control Board have endeavoured to explain the nature and extent of emission problems from the motor car in this film without unduly emphasizing the unique problem of Los Angeles smog. The alternatives to the petrol driven car are examined, as are the known methods of reducing levels of emission. This is the first film to approach all aspects of the problem fully and should be used extensively to promote general understanding of a problem which is becoming increasingly serious as the motor car population surges upward. The film has the added advantage of being admirably suited for showing to non-technical as well as technical audiences.

Inquiries relating to both these films should be addressed in the first instance to the Society.

# LONDON SMOKE

In our last issue we were able to report how a visitor from Prague to the Society's office was agreeably surprised at his first visit to London, because it was so bright and clean. In contrast, we reproduce below an extract from the City Medical Report of 1850 by Dr. John Simon, the first Medical Officer of Health to the City of London. This extract, taken from "Human Documents of the Victorian Golden Age" by E. Royston Pike,* has been sent to us by Mr. Philip Chantler, Chairman of the Economic Planning Board for the North West Region.

"Those . . . who have visited foreign capitals where other fuel than coal is employed, will remember the contrast between their climate and ours—will remember (for instance even in Paris) the transparence of air, the comparative brightness of all colour, the visibility of distant objects, the cleanliness of faces and buildings, instead of our opague atmosphere, deadened colours, obscured distance, smutted faces, and black architecture. Those, even, who have never left our metropolis, but who, by early rising or late going to rest, have had opportunities of seeing a London sunrise, can judge, as well as by any foreign comparison, the difference between London as it might be and London as it is.

Viewed at dawn and noon-day, the appearances contrast as though they were of different cities and in different latitudes. Soon after day-break, the great factory shafts beside the river begin to discharge immense volumes of smoke; their clouds soon become confluent; the sky is overcast with a dingy veil; the house-chimneys presently add their contributions; and by ten o'clock, as one approaches London from any hill in the suburbs, one may observe the total result of this gigantic nuisance hanging over the City like a pall.

If its consequences were confined to rendering London (in spite of its advantages) the unsightliest metropolis in Europe, to defacing all works of art, and rendering domestic cleanliness expensive, I should have nothing officially to say on the subject; but inasmuch as it renders cleanliness more difficult, and creates a despair of cultivating it with success, people resign themselves to dirt, domestic and personal, which they could remove but so temporarily: or windows are kept shut, in spite of immeasurable fustiness, because the ventilation requisite to health would bring with it showers of soot, occasioning inconvenience and expense. Such is the tendency of many complaints that have reached me, and of their foundation in truth and reason I have thorough conviction and knowledge . . . I ought likewise to tell you, that there are valid reasons for supposing that we do not with impunity inhale day by day so much air which leaves a palpable sediment; that many persons of irritable lungs find unquestionable inconvenience from these mechanical impurities of the atmosphere; and (gathering a hint from the pathology of vegetation) that few plants will flourish in the denser districts of London, unless the air which conduces to their nourishment be previously filtered from its dirt.

If the smoke of London were inseparably identified with its commercial greatness, one might willingly resign oneself to the inconvenience. But to every other reason against its continuance must be added as a last one, on the evidence of innumerable competent and disinterested witnesses, that the nuisance, where habitual, is, for the greater part or entirely, voluntary and preventable; that it indicates mismanagement and waste; that the adoption of measures for the universal consumption of smoke, while relieving the metropolis and its population from injury, would conduce to the immediate interest of the individual consumer, as well as to indirect and general economy. For all the smoke that hangs over us is wasted fuel . . .

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* *Published by Allen and Unwin, 1967.*

With the progress of knowledge on these subjects, a time will undoubtedly arrive, and at no distant period, when chimneys will cease to convey to the atmosphere their present immense freight of fuel that has not been burnt, and of heat that has not been utilized; when each entire house will be uniformly warmed with less expenditure of material than now suffices to its one kitchen fire; and our successors* will wonder at the ludicrous ingenuity with which we have so long managed to diffuse our caloric and waste our coal in the directions where they least conduce to the purposes of comfort and utility."

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* To the philosophical thinker there would seem to exist no important difficulty which would prevent the collective warming of many houses in a district by the distribution of heat from a central furnace—perhaps even so, that each house might receive its *ad libitum* share of ventilation with warmed air. Ingenuity and enterprise, in this country, have accomplished far more arduous tasks; and I little doubt that our next successors will have heat-pipes laid on to their houses, with absence of smoke and immense economy of fuel, on some such general organization as we now enjoy for gas-lighting and water-supply.

## Chadwick Lecture at Royal Society of Health

A Chadwick Lecture will be given by P. J. Lawther, M.B., F.R.C.P., Director, Medical Research Council, Air Pollution Research Unit, on the subject of "Current Research on Air Pollution" at the Royal Society of Health, 90 Buckingham Palace Road, Westminster, S.W.1, on Wednesday, 9 October, 1968, at 5 p.m.

An open invitation is extended to all interested. No tickets are required. It will assist seating arrangements if notification of attendance could be sent to the Clerk of the Trust, 90 Buckingham Palace Road, Westminster, S.W.1.

## A Whiff of Fresh Air

We have recently received a picture of a young Japanese girl taking a whiff of fresh air from a slot machine in busy down-town Tokyo, to refresh herself for a while, from the City's dirty smog filled air. The machine dispenses 3,000 c.c.'s of pure oxygen in one minute for about one shilling. We can be thankful in London, thanks to the Clean Air Act and timely action, we have not had to resort to similar, extremely expensive means of obtaining clean air!

# Petroleum Industry's Contribution to Prevention of Pollution

The Institute of Petroleum held a Summer Meeting at Brighton on 4–7 June to consider for the first time all aspects of air and water pollution as they relate to the petroleum industry.

The first day was devoted to the consideration of four papers on air pollution. In his opening remarks, the Chairman, Mr. T. Grieve, quoted from the Society's Year Book and emphasized the importance of reconciling the emotions displayed by the general public with the hard economic facts the oil industry was compelled to face, caring deeply as it did about Clean Air. There was a risk of being hustled into legislation in one country, he said, and such legislation if it resulted in the imposition of desulphurization on the oil industry would be costly—and ultimately the public would pay.

Mr. G. P. Liedmeier, the General Secretary of Stichting Concawe, then presented a paper written jointly with Mr. P. N. Gammelgard on "A Perspective of Air Pollution and Oil". In his introduction, Mr. Liedmeier emphasized the inevitability of man contaminating his surroundings by the very process of being alive and active and went on to say that for social and economic reasons, society no longer tolerated the view that where there was muck there was money. Smoke plumes were becoming invisible but this would not solve the air pollution problem and when the remaining pollutants came together for long periods they reached levels of concentration which threatened to affect the health and the enjoyment of property and amenities, and endanger animal husbandry and agriculture.

He then posed criteria for judging air pollution and described the role of sulphur dioxide in association with particulate matter. Some air pollutants, he said, such as hydrogen fluoride and oxidants affected vegetation as well as human health, but the plant world generally had better powers of recovery than animals and could withstand occasional acute exposure without serious impairment. There was no doubt about the necessity to reduce air pollution and to alleviate its nuisance role, which should be included in any health criteria and which was summed-up in the WHO definition of health as "a state of physical, mental and social well-being".

Mr. Liedmeier analyzed the approach to air pollution control in the more advanced countries and dealt with the special problems in the oil industry as well as the legal and economic aspects of air pollution. In connection with the latter he emphasized the importance of achieving a level of pollution which could only be improved at a cost that would exceed the benefits such improvement would confer on society. In a competitive market, he said, the additional burden of extreme pollution abatement on some suppliers may not be economically bearable and this consideration necessarily limited the experimental nature of abatement schemes. The role of public opinion was considered by Mr. Liedmeier, who in his conclusion, emphasized that the practical solution of the problems of the development of air quality standards and of technical means to comply with them was in "achieving a given pollution level by the least costly combination of means available".

Mr. P. N. Gammelgard, the Vice-President of the American Petroleum Institute and joint author of the paper then addressed the meeting in a humorous vein and mentioned that it was now being suggested in the United States that air pollution could affect the quality of loving. The Federal Government had 16 agencies involved in air pollution studies and control. This was typical of so much of the wasted time and money accompanying the problem in the U.S.

The Director of the National Society for Clean Air opened the discussion period and said that he agreed with Mr. Liedmeier that the objection to the establishment of oil refineries was often emotional. It had been the Society's experience that when a refinery had been planned there had been a lot of objection, a lot of comment and a lot of apprehension, but few complaints once refineries had been established. People chiefly objected to the invasion of their amenities.

Sulphur dioxide was a very complex problem and legislation had been introduced in a number of countries. The Society was by no means sure that legislation at this stage could produce an answer. Latest figures from the National Survey showed that the level of sulphur dioxide in the ambient air had not increased; if anything it had decreased. This improvement had been achieved by the use of high chimneys and natural dispersion. If legislation were introduced and a maximum allowable concentration figure set, who would be proceeded against if the figure were exceeded?

On the subject of pollution from motor vehicles he would like to emphasize that medical opinion was agreed that carbon monoxide emissions from cars were not at present a menace to health. The public themselves were aware of the problem and regarded motor vehicle pollution as something detrimental that would have to be confronted. Rear Admiral Sharp concluded by saying that the Society had achieved much by using the principle of the best practical means and of co-operation with all parties concerned. He hoped that this could continue, but if it were found necessary to oppose any particular industry or organization which was not doing its best to further the cause of clean air, the Society would have to take a stand against them.

In the second of the morning sessions, Dr. M. Benger introduced a paper on the "Reduction of Air Pollution Arising from Refineries" and referred to the excellent record the industry had in its relations with the Alkali Inspectorate. It was, he said, interesting to note how over the years the emphasis had shifted so that nowadays sulphur dioxide was the most discussed atmospheric pollutant and hydrochloric acid, once the paramount problem, had now receded in importance. Dr. Benger then examined the special problems confronting oil refineries, not the least being the noise factor which had now come to be commonly accepted as a form of atmospheric pollution. In describing the methods used to control refinery pollution, Dr. Benger touched on the subject of desulphurizing of residues and the difficulties this presented. He went on to describe the various methods of desulphurizing fuel gases at Battersea and Bankside costing from 10s. to 12s. per ton of fuel used. The actual cost of desulphurization of fuel oil had been assessed at £2 per ton, including the capital cost.

The discussion that followed this paper was opened by Mr. J. Beighton of the Alkali Inspectorate who mentioned that the commencement of oil refining in this country had preceded the establishment of his own Inspectorate by three years. The expansion of refining capacity since the Second World War had been truly phenomenal and in 1966 it reached the figure of 64 million tons. Despite this expansion, the Inspectorate had received help and co-operation in connection with pollution problems. However, vigilance must be maintained because of the tremendous emission potential of modern oil refineries and also the role of the discriminate complaint in assuring clean air progress. Desulphurization and the dispersion of flue gases were of major importance and both should be considered closely by the oil industry. Mr. Beighton hoped that refineries would be prepared to consider desulphurization in the future. In the subsequent discussion, the dispersal of enormous quantities of sulphuric acid that would become available if desulphurization were embarked upon was emphasized. The burden of cost was also considered in particular the importance of making a determined effort to assess the true cost of air pollution to the country.

### Reduction of Pollution from Industrial and Domestic Equipment—The Oil Industry's Contribution.

In the afternoon, Mr. H. Rowling of Shell International Petroleum examined the oil industry's contribution to the reduction of pollution from industrial and domestic equipment and in the introduction to his paper, emphasized the tremendous growth of interest in the subject of atmospheric pollution over the past ten years, a trend in which the National Society for Clean Air had played a major role in focusing this public interest and giving it tangible expression. With the use of visual aids, Mr. Rowling illustrated the changing trends in smoke and grit emission and the resultant reduction in pollution. He also illustrated some of the outstanding contributions made by the oil industry to specific problems such as fume suppression in electric arc furnaces and chimney design. The paper, written in collaboration with Mr. R. Farnsworth of the Mobil Oil Company, also dealt with the reduction of pollution from domestic sources and the technical services that the oil industry provided for work in the field.

The Chairman of the Session, Mr. R. H. Macmillan, Director of the Motor Industry Research Association, then called on Dr. S. R. Craxford to open the discussion, and in his opening remarks Dr. Craxford commented on the progressive decline in ground levels of smoke and $SO_2$ which had continued in 1967. He felt that changing social habits had been a major factor in reducing smoke emission as well as the Clean Air Act of 1956. The enormous difference between figures in the north and south emphasized just how big the effect had been and now that people in the north were responding to this pattern of social change, marked improvements in smoke prevention could be expected.

In the subsequent discussion, speakers mentioned the inter-Continental drift of $SO_2$, complaints from Sweden that other countries were depositing $SO_2$ on her soil, and the high cost of residual sulphur from fuel oil. It was emphasized that air pollution was indivisible and could not be coped with on a national level.

In the final paper of the afternoon, "The Oil Industry's Part in Reducing Pollution from Vehicles", Mr. H. I. Fuller, like the preceding speakers, made full use of visual aids to illustrate trends and factors related to the problems encountered in reducing the discharge of gaseous pollution from the motor car. He felt that legislation could not be considered until the pollutants, which were significant in a particular country or region, had been identified. When these had been established, solutions had to be devised and adapted to mass production, and new cars fitted with the appropriate type or types of control device. Regular checking and adjustment at well-equipped garages would be essential to ensure compliance with the regulations, calling for the right analytical instruments and high trained staff—all of which cost a lot of money. Mr. Fuller suggested the remedies for existing pollution problems and described the intentions of the industry to ensure that diesel engine design and maintenance should be such as to make smoke emission well nigh impossible. All U.K. new engines would have to conform to acceptable smoke-free performance standards, and the new Road Safety Act would control existing vehicles through annual testing and through roadside checks.

In the case of petrol driven vehicles, the chief potential hazard of carbon monoxide did not call for panic remedies. Exported cars to the U.S. already had to meet strict limitations of $CO_2$ and hydrocarbon emissions. It could be asserted that a radical change in gasolene quality would go a long way towards solving the problems of emissions, but this was not to say that mechanical modifications to the fuel/air system, to the combustion chamber or to arrangements for completing combustion in the exhaust manifold, were not of great importance.

Mr. Fuller outlined the activities of the oil industry in the field of reducing pollution from vehicles both nationally and in co-operation with Concawe and concluded by posing the question to the Conference, how can improvement be effected and at what cost? Increased technical or economic studies were called for as well as research to provide better understanding of the effects of pollutants on man and his surroundings. The amount of work going on was prodigious both world-wide and in the U.K.; great sums of money were being spent by the oil industry and by others to define the problems and work out the most practical remedies for reducing pollution to an acceptable level at realistic costs.

Mr. J. W. Furness, Ministry of Transport, opened the discussion by reminding the Conference of the obligation of government to take note of public opinion about air pollution. The motor vehicle population would double by 1980 and pressure for regulatory action was likely to increase for amenity as well as pollution reasons. He felt that Mr. Fuller had underestimated the effects of hydrocarbons, as the risk of photochemical smog might increase as the atmosphere in this country improved. Under no circumstances must the present level of road pollution increase.

## York Minster

The following letter from the Dean of York has been sent to us by Dr. Kenneth Hutton of York, who for many years has been a member of the Society.

Dear Dr. Hutton,

We intend to wash the whole of the Minster, both outside and inside, if the Minster Fund reaches its target. The task of cleaning York Minster is, of course, ten times greater than that of cleaning Manchester Cathedral, which I understand cost £14,000. I strongly agree with you in thinking that we ought to attempt the work. Apart from the appearance, cleaning is the best method of preserving the stone.

Yours sincerely,
ALAN RICHARDSON

# News from the Divisions

## Scottish

The Annual General Meeting and Conference of the Scottish Division was held this year at Hawick on the 22 to 24 May 1968. The attendance was rather less this year—about 80 delegates at the conference sessions compared with an average of over 100 in previous years. This was mainly due to certain local authorities restricting expenditure on smoke control following the Government's directive to local authorities to save money in the public sector.

The annual general meeting, which preceded the Conference, was held on Wednesday evening, 22 May, and Mr. John Foreman, Chief Sanitary Inspector, Dundee, demitted office as President of the Division and Mr. Malcolm M. Beaton, Sanitary Inspector, Dumbarton, the Vice-President, was appointed to succeed Mr. Foreman. Dr. William A. Horne, formerly Medical Officer of Health for Glasgow, was installed as Viçe-President. Tribute was paid at the meeting to the late Councillor William Monteith of Glasgow who had died in April. Councillor Monteith had been President of the Division for three years, Vice-President for nine years and member of the National Executive Council of the Society for many years. Latterly he had been an Honorary Vice-President of the Division. Mr. John Innes, formerly Chief Sanitary Inspector, Paisley, a past Chairman of the Society and also formerly President of the Division, was elected Honorary Vice-President. During the meeting, Mr. Arnold Marsh, former Director and Secretary of the Society, was presented with a gift as a token of appreciation for the way he had supported the Scottish conference over a long number of years.

There were four speakers at the conference including Mr. Marsh and Mr. John Christie (their papers appeared in the Summer issue of *Smokeless Air*). The other two speakers were Mr. A. Campbell, a Group Manager of the Scottish Gas Board, whose paper is reproduced in full in this issue of *Smokeless Air*, and Dr. R. M. Gordon, Senior Medical Officer, Scottish Home and Health Department, who spoke on Medical Aspects of Pollution from Motor Vehicles. The main conclusion in Dr. Gordon's paper was that medical researches have not shown to date that the emissions from the exhaust of motor vehicles caused any measurable ill-health. He pointed out, however, that we should not be complacent about the future, especially since the number of cars on the road would probably double by 1974. Dr. Gordon was of the opinion that the problems of atmospheric pollution from the motor vehicle are small compared to that which arises in built-up areas from domestic chimneys and other sources.

In spite of the disappointing attendance the conference was excellent and the Division is grateful to the Provost and the Town Council of Hawick for the hospitality received. In addition to the conference, visits were arranged to various knitwear mills in Hawick and the delegates also enjoyed a bus-run to the Scott country. The Scottish Division was glad to welcome the new Director, Rear Admiral P. G. Sharp, to his first Scottish conference which, it is hoped, will be a forerunner to many more.

*J. W. Traill, Hon. Secretary*

# Northern Ireland

Members of the Northern Ireland Division attended the official inauguration of the City of Belfast's Naphtha Reforming Plant on the 14 May, 1968. The Belfast Corporation has discontinued the carbonization of gas from coal and the new Refining Plant is producing gas from oil refinery feed-stocks. A Vickers-Zimmer continuous low pressure plant has been installed and the six continuous catalytic reforming furnaces are each guaranteed to produce 3·75 m.c.f.d. of 450 b.t.u. gas at an outlet pressure of 25 p.s.i. This is capable of further extension by two additional furnaces to provide an ultimate total capacity of 30 m.c.f.d. and will thus make a significant contribution to the greatly increased demand for smokeless fuel that has resulted from the passing of the Northern Ireland Clean Air Act.

The new plant was opened by Lord Erskine of Rerrick, G.B.E., Ll.D., with the Rt. Hon. Lord Mayor of Belfast, Alderman Major William Duncan Geddis, J.P., and members of the City Council and the contractors representatives in attendance.

*W. E. C. O'Brien, Hon. Secretary*

# Yorkshire

On the 10 May the Yorkshire Divisional Council held its second 1968 meeting at the Viceroy Works of Messrs. Universal Machinery and Services Ltd. at Millshaw, Leeds, 11. The minutes of the first meeting on developments in British Railways which was held on 3 April were confirmed. Under correspondence, a letter regarding smoke control in Barnsley was read, and there was considerable discussion on this matter. The Hon. Secretary was instructed to contact Mr. Pemberton, the Chief Public Health Inspector of Barnsley about the next meeting and also to invite Barnsley Corporation to send delegates to the next meeting at Grimethorpe and to consider becoming a member of the National Society for Clean Air.

After lunch there was an open meeting to which all the Chief Public Health Inspectors in the Yorkshire Division had been invited. Seventy-five people attended the meeting and heard a technical talk on "Recent Developments in Smokeless Incineration" by Mr. R. Brett-Littlechild, who explained how the Company's refuse incinerators have been redesigned to increase efficiency. Venturi blocks have been fitted in the top section of the main combustion chamber to reduce grit and fly-ash emission. These Venturi blocks ensure that the gas streams from the primary combustion stage are split into small fractions and second stage burning takes place reducing the amount of work to be done in the third stage burning in the mixing chamber.

On the 13 June the Yorkshire Divisional Council held its third meeting of the year at the Grimethorpe Works of Messrs. Coalite and Chemical Products Ltd. This was another open meeting and 90 delegates attended. In the morning the delegates were arranged in parties and were conducted on an instructional tour of the manufacturing plant.

The third major plant for the production of 'Coalite', commenced production in December 1966, only 18 months after plant construction commenced. The completed works comprises 20 batteries each of 40 retorts, together with all

*Grimethorpe Works, Barnsley. A general view showing the single stack and conveyor belt of the plant*

necessary ancillary sections. The plant is highly automated and the most modern techniques are employed to achieve smoke abatement and the treatment of effluents.

Raw coal—smalls and singles—from the adjacent Grimethorpe Colliery and nearby Ferrymore, is transported by conveyor belt direct to the works, which has a carbonizing capacity of 550,000 tons of coal per annum. This combines with the output of the other Coalite plants in an overall annual consumption of nearly 1,750,000 tons from which 1,250,000 tons of Coalite are derived. Those who visited the plant were impressed by its overall tidiness and the advanced degree of automation and mechanization achieved—understandable when one considers it represents a capital investment of some £10,000,000.

Mr. Francis L. Waring, F.Inst.F., the Managing Director of Coalite and Chemical Products and a life-long adherent to the cause of clean air, told members of the Division that he thought it was positively disgraceful that new homes should be built without chimneys as there were many people all over the country who wanted to retain an open fire. Removing the chimney was taking away their freedom of choice.

The delegates were entertained to lunch at the Kerrisforth Hall Country Club and Mr. Waring said that it gave him great pleasure to welcome members of the National Society for Clean Air to Grimethorpe, especially as Mr. A. C. Saword, the National Chairman, was present.

After lunch Mr. C. E. Needham, the General Manager Carbonization and

Fuels, addressed the delegates on "Production and Supply of Solid Smokeless Fuels" ranging from Gas Coke, Barnsley Burnbright, Room Heat, Homefire, and Rexco to Coalite. He stressed that the difference in cost between coal, non-reactive solid fuels and Coalite was now less than 5 per cent, and pointed out that because Coalite could be burnt on a smaller fire, the cost of house heating with Coalite was not higher than that of any other fuel. In the discussion which followed his talk, Mr. Needham dealt with a number of questions. Speaking of the moisture content of Coalite, he stated that this was necessary to prevent spontaneous outbreak of fire on the wagon during delivery, and that what really mattered to the householder was the total calorific value of the fuel.

Mr. Saword, in thanking Coalite and Chemical Products Ltd. for the arrangements that had been made for this meeting, said that he was particularly pleased to have been informed that Barnsley Corporation had now agreed to become a member of the National Society for Clean Air.

*J. Goodfellow, Hon. Secretary*

*One of the parties of members of the Yorkshire Division inspecting the Grimethorpe Works of Coalite and Chemical Products Ltd. on 13 June 1968. From left to right: A. Goodsell, Joint Assistant Managing Director; James Goodfellow; C. McDermott, Works Manager; Francis L. Waring; A. C. Saword*

# East Midlands

Members of the Division assembled at the recently opened House Warming Centre in Maid Marion Way, Nottingham, by invitation of the National Coal Board, and were welcomed by B. H. C. Clark, Esq., Deputy Regional Marketing Director, National Coal Board, North Midlands Sales Region, in the absence of W. J. Burton, Esq., the Regional Marketing Director. Mr. Clark spoke of the value of House Warming Centres in the furtherance of clean air and of the way such Centres assisted Local Authorities with their smoke control programmes. The display of a very wide range of solid smokeless fuel burning appliances gave the opportunity for the general public to see and discuss the relative merits of these appliances. Advice was also available at the Centres concerning the availability and suitability of solid smokeless fuels in their locality. Following Mr. Clark's welcome, the Chair for the morning session was taken by Councillor M. Hewitt in the absence of the Chairman of the Division, and he introduced C. H. Perry, Esq., Sales Promotion Officer of the National Coal Board, who gave an illustrated talk entitled "The Application of Solid Smokeless Fuels in Smoke Control Areas". His talk dealt with a wide range of appliances now available, comparing their individual efficiencies and relative costs, and made particular reference to the assistance now available from the National Coal Board with installations of whole or partial house central heating. In recommending this form of heating, Mr. Perry made the point that the low output warmth which could be maintained throughout the day without attention, where tenants were at work, overcame the occurrence of mould growth on walls of new dwellings, which had proved something of a problem where certain types of heating were installed. He also referred to the latest development in solid fuel ducted warm air appliances as an alternative to the conventional type of central heating. At the conclusion of his talk Mr. Perry answered questions raised by the members.

A film was then shown of the Rowlatt's Hill, Leicester District Heating Scheme, where 507 housing units are provided with full central heating and domestic hot water supply from a single heat source, the heat source being a central boiler house, housing four welded steel boilers, together having an output of 26 million Btu's/hr., and consuming approximately 2,200 tons of washed singles per annum, the plant being almost completely automatic in operation. Each dwelling was provided with a 25 gallons hot water storage cylinder and space heating was provided to the tenants as a metered supply, the total cost averaging 22s. per week per dwelling.

This excellent film demonstrated the forward thinking in Town Planning of the Leicester City Council and provided a good example of what could be done in providing adequate heating in a high density housing scheme, making effective use of an indigenous raw material, at the same time fulfilling the aims and objects of the Society in reducing to a minimum the pollution of the atmosphere. Commenting on the film, Mr. Clark stated that the National Coal Board were prepared to assist Local Authorities both by advice and by finance in the development of district heating schemes of this nature. After the film members were divided into parties for a conducted tour of the House Warming Centre, including the fully automatic solid fuel heating system of the Block. Members were then entertained to a buffet lunch at the Centre by kind invitation of the National Coal Board.

The afternoon session was devoted to a visit to the Hyson Green Development of the City of Nottingham, where 593 dwellings comprising 471 maisonettes and 122 flats were heated from a central source by the N.C.B., under contract to the Nottingham Corporation. Here, central heating is connected to a coal-fired boiler plant distributing water at a temperature of 250°F. to heating units in the dwellings, from which ducted warm air passes into the rooms for space heating. Domestic hot water at a temperature of 140° is also maintained in each dwelling. Members had the opportunity to visit representative living units when they had an opportunity of ascertaining tenant reaction to this system of heating. In the case of this Scheme, heat was sold to the Nottingham Corporation by the N.C.B., and re-charged to the tenants at weekly rates ranging between £1 and 24s. 6d.

At the conclusion of a very interesting tour of inspection members returned to the House Warming Centre for afternoon tea provided by the N.C.B. The Chairman, Mr. J. F. Edwards, thanked the National Coal Board through Mr. Clark, for the excellent arrangements and hospitality; Mr. Perry for his interesting talk; Mr. H. B. Dunston for his work in organizing the meeting, the Housing Department of the City of Nottingham, and all those who had contributed towards its success.

The Annual General Meeting of the East Midlands Division was held in Cambridge on Thursday, 11 July 1968, 58 members braving the very inclement weather, flooded roads etc., to be present at the meeting.

Members were welcomed by Alderman C. E. Ridgeon on behalf of the Cambridge City Council who said it was a pleasure and an honour that the meeting should be held in Cambridge as the Chairman of the Division was a Cambridge man, and an official who was held in high regard. Alderman Ridgeon went on to say that his Council was in sympathy with the aims and objects of the Society, and whilst the City was not troubled by industrial pollution, they, like other urban Authorities had a domestic smoke problem, and a few years ago had created a smoke control area in the centre of the City. He regretted, however, that Cambridge did not stand very high in the "league" table in the expansion of domestic smoke control and suggested that mandatory powers was the solution. The Chairman, Mr. J. F. Edwards, welcomed and introduced Rear Admiral P. G. Sharp, C.B., D.S.C., the new Director and voiced the pleasure of all present that the Director had been able to visit the East Midlands Division so early after taking office. Replying to the welcome, Rear Admiral Sharp said that it was his intention to visit all the Divisions in turn and that he was particularly pleased that the first of these should be Cambridge.

In the election of Officers that followed, Councillor F. Brothwell, Bolsover U.D.C., was elected Chairman and Councillor J. H. Gregory was elected Deputy Chairman. Mr. G. Drabble, Chief Public Health Inspector of Chesterfield was re-elected as Honorary Secretary. Mr. H. N. Eardley was re-elected as Honorary Auditor. Mr. V. Wales and Mr. W. R. Brownhill were re-elected as Scrutineers.

Following the business meeting an illustrated address entitled "Domestic Oil-Fired Heating and the Clean Air Act" was presented by P. F. Heitzman, Esq., of the Domestic Technical Services of Shell-Mex and B.P. Ltd. The talk was illustrated by slides showing various systems in which oil fuel can be used for both small and large central heating schemes. The talk provoked interesting discussion and many questions were asked which were ably dealt with by the speaker. The Chairman expressed thanks to the speaker for his excellent paper, and to his technical assistants, and also to those who had taken part in the discussion.

*G. Drabble, Hon. Secretary*

# South East

On the 11 June a small party of members visited the Queen Mary College Nucleonics Laboratory, London, and saw the 50 kW Nuclear Research Reactor which is used to assist research projects undertaken by the College. The Laboratory is part of the Nuclear Engineering Department at the College which is the only one in the country offering a three-year undergraduate course in nuclear engineering. The research work involves investigation of reactor behaviour and the use of the reactor as a source of neutrons for physics research. The first category includes reactor control, measurement of reactor characteristics and behaviour of the system to external disturbances. The second category includes investigation of the effect of neutrons on different materials and the behaviour of different arrangements of power reactor type fuel elements.

The party was under the care of Dr. J. Shaw, Head of the Department, who explained this highly complex subject in a clear and lucid manner. On the conclusion of the tour of inspection Dr. Shaw answered questions from members. Refreshments were served following the visit and a vote of thanks to Dr. Shaw and the College authorities, moved by Mr. G. B. Courtier, was carried with acclamation.

On the 3 July a small party of members were the guests of the National Coal Board at Snowdown Colliery, Kent. After changing into old clothes and being provided with safety helmets and lamps the party, led by Mr. W. Anderson, Training Officer, descended smoothly and at high speed, the 3,000 foot shaft. A short walk to the "train" (not exactly a Pullman) was followed by a $2\frac{1}{2}$ mile ride. From this point members continued on foot, under increasingly difficult conditions, and, to the surprise of all, in a temperature of between 90° and 100°F., to a coal face. Here the operation of a mechanical coal cutter was explained, not, as some members anticipated, in pure Gaelic, but in a fruity Scotch accent. The party then made the return journey sweating, dirty and perhaps a little tired, to the bottom of the shaft by foot and "train", and were never in their lives so glad to avail themselves of a hot shower at the pit head baths. Refreshments were provided in the canteen and Mr. Anderson answered questions.

As most of the party were visiting a coal mine for the first time, this was an intensely interesting experience for which our thanks are due to the National Coal Board. The conditions under which miners work and the toil, sweat, danger and discomfort which go into coal winning surely demand that coal should be used in the most efficient way possible with every ounce of its valuable chemical constituents and every Btu it can produce being used to full advantage.

A welcome innovation in Divisional Council meetings took place on the 16 July, when the Council accepted the invitation of the Thurrock U.D.C., to spend a day discussing the air pollution problems of the Urban District, particularly those arising from the cement industry. The morning was spent at the

Tunnel Works of the Tunnel and Portland Cement Co. Ltd. The party was welcomed by the Manager, Mr. S. Ward and then the process of cement making was explained by his assistant Mr. Limmer. Under the guidance of Mr. Ward and Mr. Limmer members then inspected the plant and saw all phases of cement manufacture. They were able to see the precautions taken to prevent excessive dust emission and assess the effectiveness of the measures taken and the extent of the problem still remaining. Members were joined at lunch at the Civic Hall by Cllr. A. F. Barnes, J.P., Chairman of Thurrock U.D.C.

After a splendid meal and a peep at the new swimming pool which forms a part of this fine civic project, the party adjourned to the Council Chamber for an afternoon meeting. Mr. H. A. Gosling, Chief Public Health Inspector, Thurrock U.D.C., and Mr. Limmer of the Tunnel and Portland Cement Co. Ltd., spoke, followed by Mr. H. Brigg, Alkali Inspector for the Area, who was present throughout the day. A most useful and interesting discussion followed from which it emerged that although air pollution from the cement industry had been considerably reduced in terms of grains per cubic foot, of flue gas, under certain conditions a serious nuisance could be caused, in fact, the plume from the stacks, consisting largely of steam but obviously with an appreciable dust content, could be seen coming down to ground level about a mile from the works.

The Division is greatly indebted to the Thurrock U.D.C. and its Chairman, Cllr. A. F. Barnes, J.P., The Tunnel and Portland Cement Co. Ltd., and its Manager, Mr. S. Ward and his assistant Mr. Limmer, and the officers of the U.D.C., for the hospitality and first class arrangements made for the day's proceedings.

*J. S. Hodgins, Hon. Secretary*

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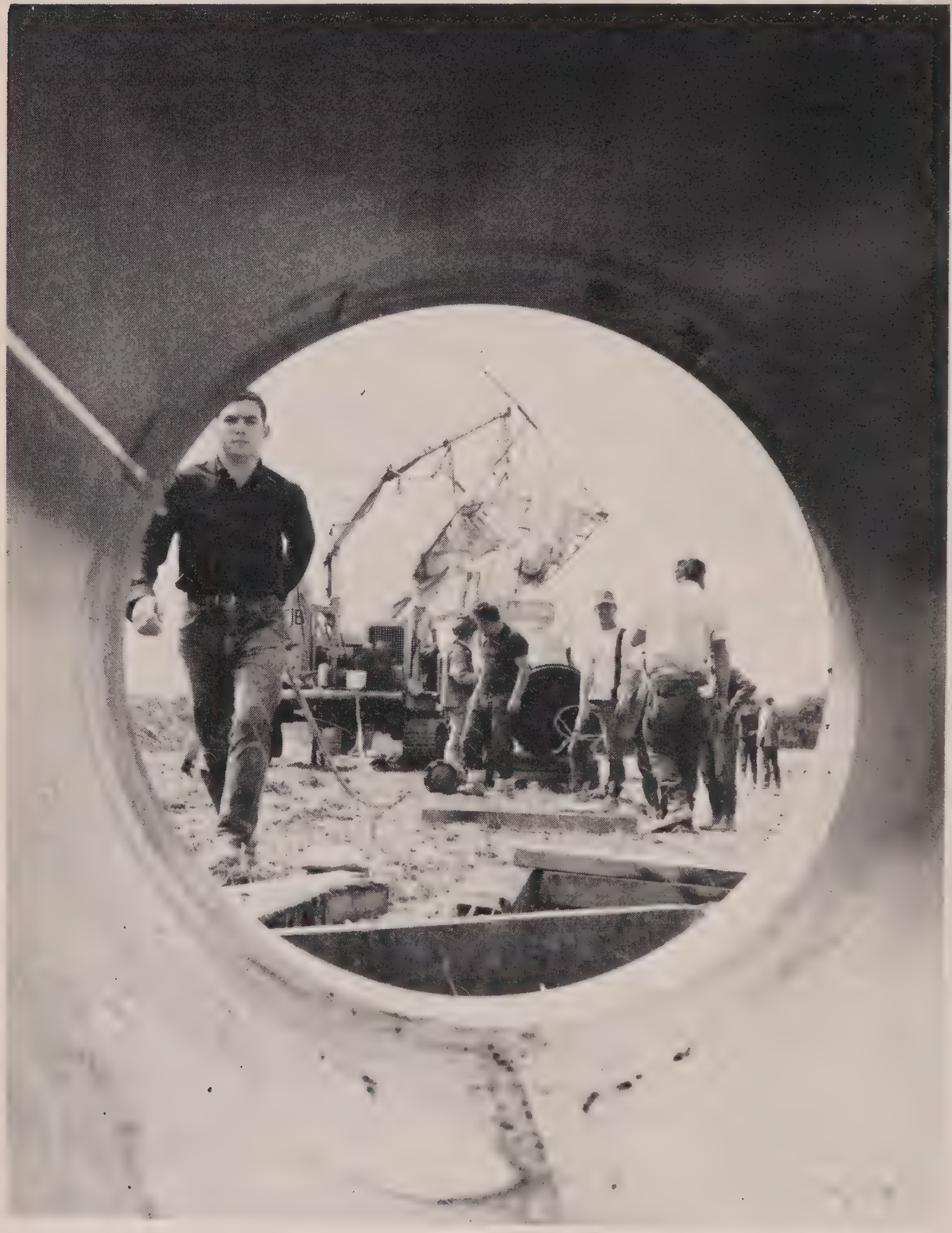
# Feeder Main for North Sea Gas

SMOKELESS AIR took part in an interesting press facility visit on 18 July, which was organized by the Gas Council, in association with C.J.B. Pipelines Ltd., and the Eastern Gas Board, to inspect the progress of work on the No. 3 Feeder Main for North Sea gas. The giant pipeline stretches from the Bacton terminal on the Norfolk coast, to Whitwell, near Stevenage, Herts, where it will connect with the backbone pipeline of the Gas Council's original gas transmission system, and will ultimately be capable of delivery of about 1,000 million cubic feet of natural gas a day.

The construction of this 106 mile long 36 inch diameter gas pipeline started in April, the contract being awarded to C.J.B. (Pipelines) Ltd., and is scheduled to be completed by the end of 1968.

The press party were taken to see three stages of the pipe laying process: the welding, lowering in and re-instatement of the land. It was impressive to learn that the people employed on the pipeline work a 68 hour week, seven days a week! It was also fascinating to watch the skill which the welders employ to produce a consistent 70 joints a day. X-ray examination of all welds is carried out by specially developed equipment which crawls along the inside of the pipeline.

At the site where lowering-in was taking place, the welded lengths of pipe



*Inside the 36 inch diameter pipe*

*Progress on this year's Giant Pipeline*

could be seen lowered into the trench by sideboom pipelayers, section by section, up to 200 yards each in length.

Finally the visitors were shown a stretch of land over a part of the completed pipeline, with only a faint trail showing that the operation took place quite recently. This is achieved by the topsoil being kept separate and being carefully replaced and re-instated to the requirements of the landowners.

In his address, Mr. A. Hetherington, Deputy Chairman of the Gas Council remarked on the fact that within months of the laying of the first natural gas line, crops were growing immediate above it. He said: "Taking gas underground itself helps to protect our amenities. For one thing it does not throw extra burdens on our transport systems. For another, it disturbs the countryside much less than many alternatives. We are, after all, planning to bring in massive

*Welding up the pipe*

amounts of energy through our system; they will give a boost to British industry by providing a new low-cost fuel, they will help to increase standards of living by making houses more comfortable and they will save substantial amounts of foreign exchange. I hope you will agree that the inevitable, temporary inconvenience of pipeline laying is greatly outweighed by such considerations".

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## LETTERS

*To: The Editor,*
*Smokeless Air*

1 July, 1968

Sir,

The summer edition of *Smokeless Air* contained a report of Lord Kennet's far-reaching review of progress made and advances foreseen in clean air which he gave after the Society's Annual General Meeting in his capacity as Joint Parliamentary Secretary to the Ministry of Housing and Local Government. I was sorry, however, to read his view that solid fuel will have an important part to play in the reduction of domestic smoke for a long time to come due to social and economic factors unconnected with air pollution. I believe the effect of implementing such a policy will be to perpetuate air pollution from domestic sources for a long time to come, because it is well known that coal-based "smokeless" fuels continue to pollute the atmosphere with smoke and sulphur dioxide, and there is evidence that heavy pollution still occurs during adverse weather conditions in areas which have become smoke-controlled.

There are of course very good social and economic factors in favour of achieving clean air as quickly as possible and if the Government believes that a continued, considerable use of solid fuel on domestic grates is necessary (although there are cleaner fuels available) we are perhaps entitled to some details of the balance sheet, showing the social and economic factors "for" and "against", on which the decision was made. It would be interesting to know what weight was given to statistics relating to bronchitis and other diseases in city and urban areas.

At least, the Clean Air Society should make clear its own attitude to partially clean air as technological advances in the fuel industries bring more of the final target within reach.

Yours faithfully,
K. WILLIAMS,
Chief Public Health Inspector

*Town Hall, Cheadle.*

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### Death Attributed to Air Pollution

*Midland News* reported on 22 July 1968 that air pollution by pollen and other materials had been blamed for the death of a 63 year old asthma sufferer at an inquest at Stoke-on-Trent. A doctor told the inquest that there had been a quite exceptional increase in pollen in the air immediately before the death of the victim who he described as being hypersensitive to pollen.

"Air knows NO Frontiers"

# INTERNATIONAL NEWS

## The International Union of Air Pollution Prevention Associations

We are pleased to be able to report that the History and Constitution of the I.U.A.P.P.A. was published in May 1968 in booklet form. The aims of the booklet are to permit prospective members to become acquainted with the objectives of this international non-governmental body for co-ordinating the efforts of the different nations to obtain clean air, and to demonstrate how it is possible for scientists, administrators, the representatives of industry and members of the general public throughout the world to co-operate for the common good of mankind.

The International Union considers that the problems of air pollution are receiving more and more attention throughout the world, and that the time is right for the extension of the Union's activities to make it an effective international body for the stimulation of understanding, education, training and research in the field of air pollution and control.

Dr. C. E. Barthel, Jr., the President of the I.U.A.P.P.A. for the period 1967–1970 traces the history of the Union from the time when it was a dream of nine past presidents of the Air Pollution Control Board of the United States, to the present day. Early in 1964, five national air pollution prevention associations, one of which was our own N.S.C.A., were invited to work with the A.P.C.A. of the United States to establish an international union. Meetings were held in Washington and Houston in June 1964 and a Constitution was drawn up. This was ratified by all members in January 1965.

In August 1965, Sir Alan Wilson, then President of the N.S.C.A. became the I.U.A.P.P.A.'s first President and the Union's first Secretary was Mr. Arnold Marsh, then Director of the Society.

In October 1966 the Society was the Host for the International Clean Air Congress and Exhibition which was held in London.

The Union now has seven members:—

Association Argentina Contra la Contaminacion del Aire, Argentine.
Association pour la Prevention de la Pollution Atmospherique, France.
V.D.I. Kommission Reinhaltung der Luft, Germany.
National Society for Clean Air, Great Britain.
Kanto-Shin-Etsu Heat Control Society, Japan.
Air Pollution Control Association, United States.
Clean Air Society of Australia and New Zealand.

The next International Clean Air Congress and Exhibition will be held in Washington D.C., U.S.A. in December 1970.

The Constitution and Byelaws of the Union, to which Mr. Marsh was a signatory, are printed in English, French, German, Spanish and Japanese.

Many readers will remember the London Congress in 1966, but to some it may be becoming just a memory. The publication of the History and Constitution of the I.U.A.P.P.A. serves as a salutary reminder that the Society has an international as well as a national role to fulfil and that we must start planning and preparing for the part we must play in the next International Congress.

U.S.A.

## Pollution from Jets

It is reported in "Environmental Science & Technology" (May 1968) that air pollution caused by jet engines will be investigated under a new $250,000, three-year programme, according to Secretary of Transportation Alan S. Boyd. The Federal Aviation Authority will investigate: production of aircraft engines that cause less smoke and exhaust pollution; research on additives that will reduce exhaust smoke; development of a standard for exhaust smoke and invisible pollutants; proposal of regulatory action for aircraft when smokeless additives and engines are produced to meet the acceptable pollution level. Although aircraft exhaust contributes only about 1 per cent to the total air pollution, aircraft exhaust obscures visibility, soils the physical environment in and around airports and causes other deleterious side effects.

## Computer for dispersion of $SO_2$

The U.S. Public Health's Service's National Centre for Air Pollution Control, the Chicago Department of Air Pollution Control and the Atomic Energy through its Argonne National Laboratory are engaged in a joint study to develop a computer programme which will predict the dispersion of sulphur dioxide from coal and oil-fired plants in the City of Chicago. The major purposes of the Chicago study are:—

(1) To predict levels of sulphur oxides during air pollution incidents and to establish an effective pollution warning system;

(2) To develop plans to minimize the severity of pollution incidents. Such plans would include switching power plants from coal to natural gas, shifting electrical power loads and substituting a low sulphur coal or oil for high sulphur fuels of this type in plants that cannot burn natural gas;

(3) To develop long-range city and county plans which take into account the air pollution problem in the layout of residential, industrial and commercial areas.

## Control of Pollution in the National Capital

Recommendations for control of interstate air pollution in the Washington D.C. metropolitan area have been issued by the Secretary-designate of Health, Education and Welfare, Wilbur J. Cohen. Other recommendations, specifically aimed at the control of sulphur oxides, odours, dust and smoke include:—

(1) No fuel oil containing more than 1·5% sulphur by weight should be sold or burned after 1 July, 1968, and no more fuel oil containing more than 1% sulphur by weight should be sold or burned after 1 July, 1969.

(2) Sulphur content of coal should be reduced to the lowest practicable level as rapidly as possible. After 1 July, 1969, no coal with a sulphur content of more than 1% should be burned or, in lieu of burning low-sulphur coal, by 1 July, 1973 any source may operate a combustion-gas desulphurization system which will result in sulphur oxide emissions no greater than would the burning of 1% sulphur coal.

(3) Emissions of particulate matter from all fuel-burning operations should be strictly limited.

(4) All open burning of combustible solid wastes should be discontinued within 12 months.

(5) Solid wastes should be disposed of by acceptable sanitary landfill practices or in controlled incinerators.

(6) Co-operative investigations and studies should be conducted by the Metropolitan Washington Council of Governments, and a report submitted to the Conference participants within 12 months, regarding the most effective, efficient and economical methods for long-range, pollution-free solutions to the regional solid waste problem in the entire metropolitan area.

(7) No later than 31 December, 1968, visible discharges to the atmosphere from any new stationary sources, not exceed a degree equal to an emission designated as No. 1 on the Ringelmann Smoke Chart. Existing sources of air pollution should meet this standard for new sources, except that until 31 December, 1972, discharges should not exceed No. 3 on the Ringelmann Smoke Chart for 4 minutes in any 60-minute period and for an aggregate of 40 minutes in any 24-hour period.

(8) No later than 31 December, 1968, discharges into the atmosphere from any process source should be strictly limited.

(9) Smoke emissions from motor vehicles (gasoline and diesel powered) should not exceed Ringelmann ≠1. Within one year, vehicles with air pollution control systems should be inspected annually. The vehicle inspection programmes of the District of Columbia and the State of Virginia should be modified, and the State of Maryland vehicle inspection programme should be extended, to include emission measurements as soon as practical techniques are available.

(10) State and local agencies should continue to monitor atmospheric levels of pollution and advise the Secretary of any apparent need for more stringent control of new motor vehicle emissions.

(11) Within six months buses equipped with two-stroke diesel engines and regularly operated in the metropolitan area should be fueled by No. 1 Diesel Oil.

(12) The District of Columbia and the States of Maryland and Virginia, utilizing the Metropolitan Washington Area Transit Commission should investigate and report in writing to the Presiding Officer by 1 November, 1968, and at six-month intervals thereafter: the feasibility of vertical exhaust systems for transit coaches, development of inspection systems for black smoke in diesel bus exhaust, merits of two-stroke and four-

stroke diesel engines from the standpoint of smoke and odour, and the progress made by operators of buses equipped with two-stroke diesel engines in complying with the recommendation for the use of No. 1 Diesel Oil.

## Japan

That the exchange of technical know-how in the field of air pollution control is truly international and stretches far afield, is illustrated by the following two items of industrial information:—

(1) The Isogo Power Station near Yokohama, had a fly-ash recovery problem which was solved by electrofilters supplied and erected by the Toyo Engineering Corporation under licence from Lodge-Cottrell Ltd., Birmingham. After investigating Japanese coals with an extremely low sulphur content, which when fired resulted in fly-ash with a high resistance to electrofiltration, Lodge-Cottrell patented a method of conditioning by injecting stabilized $SO_3$ into the gas stream ahead of the electrofilter.

(2) A new refuse incineration plant of Japanese design is to be manufactured and marketed by West's (Manchester) Ltd., a member of West's Group of Industries. The Company has concluded a licensing agreement with the Takuma Boiler Manufacturing Co., Ltd., of Osaka, leading Japanese manufacturers of refuse incinerators. Theirs is a continuous closed system, achieving complete combustion of refuse without atmospheric pollution. A unique grate design ensures efficient transport of the burning refuse and creates maximum disturbance and aeration of the furnace bed. Installations with a total refuse destruction capacity approaching 10,000 tons per day are operating or under construction in Japan, where refuse disposal problems are similar to those in Great Britain and Europe.

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## Completed Smoke Control Programme Makes Flying Safer

Cheadle and Gatley Urban District Council are to be congratulated on being the first local authority in England (outside London) to complete its smoke control programme. On 1 August, 1968, the last of 10 smoke control orders was implemented and 20,389 premises in an area of 5,299 acres are now smokeless.

The total cost, shared by the Exchequer, the Council and the residents themselves was of the order of £670,000.

Apart from the benefits of cleaner air to the residents of Cheadle and Gatley, there is now increased visibility on the main approach route into Manchester airport, which passes over the district, which makes for safer flying.

# REVIEWS

## 104th Annual Report on Alkali, etc. Works by the Chief Inspectors, 1967

The importance of close co-operation between local authorities and the Alkali Inspectorate is emphasized in this comprehensive and very interesting report which was published on 24 July.

Alkali Inspectors pay twice yearly visits to all local authorities with registered works in their areas and use this opportunity to discuss more general problems with officials of public health departments. By means of these visits, the report states, inspectors are now able to help local authorities more than ever before with technical problems concerning air pollution which were outside the scope of their immediate responsibilities, and advise them on such matters as chimney heights, planning of new estates near industry, and the erection of tall buildings close to large existing sources of smoke or dust. In return, local authority inspectors report to the alkali inspectors any troublesome emissions they noted at registrable works and the remedies applied.

The report goes on to describe in detail the policy of the inspectorate towards enforcement and prosecution and emphasizes the important co-operative part played by industry, usually through trade associations and their research departments. Industry is offered a partnership with the inspectorate in finding solutions to difficult technical problems. In fact, there have been only three prosecutions in the last 47 years, the last one being in 1967. On the other hand, the Alkali Inspectorate is in a peculiarly advantageous position to keep a careful watch on developments in the control of pollution. "We are frequently consulted in the earliest stages," says the Chief Inspector, "and can often contribute usefully. It is far easier and much less costly to incorporate air pollution control equipment at the design stage than to put it into a completed plant".

The chief inspector estimates that industry spends several hundreds of thousands of pounds on research into these problems. "This participation by the trade associations is a good guarantee of their support in enforcing requirements amongst their members," states the report. It also discusses the role of local and central authorities and concludes that both are needed for best results and that in Britain we have a good blend of both.

The report shows that the number of works concerned in specific complaints investigated by the alkali inspectors, largely at the request of local authorities, was 379 in 1967, compared with 350 for the previous year. Many of the complaints, however, were concerned with cases which were known to have improved in recent years, the report states.

"Public opinion demands a steady improvement in the cleanness of air, but there is a price to be paid for it which ultimately falls on the public, and the inspectorate has to interpret the public's wishes about the balance to be maintained between what is practicable and what is desirable," the report comments. "The sums involved are considerable. For example, the cost of equipment to prevent or control air pollution at a 2,000 mW power station is about £3½ million which is, of course, borne by the consumers of electricity generated. Expenditure on reducing pollution from domestic fires is substantially smaller than expenditure in industry, although the former is still the major national contributor to air pollution."

A feature of this year's report is a review of industrial developments in Wales in relation to air pollution problems. The industrial revolution which Wales, along with the rest of the United Kingdom, has undergone in the last two decades has been generally accompanied by improved air quality where old processes have been replaced by new, the report concludes. Some fresh problems have, however, been created. "There is room for improvement and all concerned, local authorities, industrialists, the public and the inspectorate, are determined to achieve the best practicable conditions in the shortest possible time," it adds. The trend in air pollution records was encouraging. For example, the report admits that the Phurnacite Plant at Abercwmboi, although itself producing an authorized fuel, has come in for much local complaint. But "a great improvement has resulted from the burning of gases evolved during discharging of the product. The first of the re-built batteries, incorporating the most up-to-date technical developments, should be ready for operation early in 1968."

The air pollution problems of the cement industry are dealt with at length in the report, Appendix V of which is a reprint of the latest "best practicable" means requirements of the chief inspector, as revised during 1967 in the light of recent technological developments in arrestment.

The report notes that there has been much uneasiness about the possible effect on health of chimney dust from cement works. "We have had the advantage of many years' experience in this field and the final conclusion has been that the physical effect is practically nil," the report states. "The only effect noticed is psychological, due to irritation caused by the deposit of dust on roofs, cars, furniture, washing and vegetation when the deposit was heavy." The materials in this dust were not known to be deleterious to health. Improvements in dust prevention from Thames-side works had reduced the mass emission in 1967 to 59 per cent of what it was in 1964.

The total number of visits and inspections during 1967 was 9,781 compared with 10,771 in 1966. Of these 417 were to, or in connection with, works not registered under the Alkali Act, 41 were concerned with the control of radioactive emissions and five were concerning colliery spoilbanks.

### New French Reference Book

We have received from the French Prime Minister's department for scientific and technical research a volume in French, entitled "Pollutants and Nuisances of Industrial and Urban Origin". Volume 2, published in December 1967, has been compiled by M. Jean A. Ternisien, in collaboration with foreign embassy services in Paris, intergovernmental organizations and international associations concerned. It deals with the prevention of a wide range of environmental problems—including air pollution—and with the scientific, technical and legal problems encountered by the international experts.

### Statistical Digest, 1967. The Electricity Council

This card contrives to pack a great deal of information regarding the work of the Electricity Council in a very compact space. It forms a very useful and handy reference for facts and figures.

### "Industrial Waste Disposal." Edited by Richard D. Ross. pp. 340. Reinhold, London. £7 9s. 6d.

The problem of industrial waste is that modern man appears to be willing to allow it to proliferate, as if by so doing he can demonstrate in yet another way to the material abundance he has inherited. This very comprehensive survey of the multiplicity of the problem examines in the first chapter the philosophy of waste management and we become aware that the editor, Richard D. Ross, is proud to be numbered among "these small voices crying in the wilderness" concerned with deflecting man from the road of self-destruction "by misuse or abuse of his creations and inventions."

What follows is not all of relevance to the British scene (the book and all its contributors emanate from the other side of the Atlantic). The second chapter on waste gas treatment, which occupies just over a quarter of the book is written by James P. Tomany of a Greenwich, Connecticut, oil products company and is undoubtedly as thoroughly exhaustive and complete a survey as has appeared in print to date. The pre-occupation with particle sizes, dust and sampling techniques and design of equipment, with the related capital investment and operating cost aspects, is of mainly academic interest to those involved in the problems in this country. However, with the world trend tending to follow the measurement, standards and control legislation philosophy there is much of great value here.

The 96 pages devoted to waste liquid treatment deals with problems that do not normally come within the purview of readers of this journal. Nevertheless so exhaustive a survey of the pollution problems common to the waters of all highly industrial societies will undoubtedly be of considerable value to specialists in the field.

Incineration as a means of waste disposal is considered in Chapter IV by Messrs. Elmer S. Monroe and C. Thomas Hayes, both authors being on the staffs of eminent companies in the engineering field in the United States. They consider various methods of direct flame and catalytic incineration and confront the difficulties of disposing of a great variety of wastes, nylon, sawdust, plastic pellets and other residues. The characteristics of good incinerators are listed alongside those of malefactors and there is a near plethora of basic data and combustion calculation which will gladden the heart of the specialist even if effecting its implementation will sully his joy somewhat.

Odour and final disposal have their place in this volume and a chapter on Radioactive Waste Management has obvious immediate and long term value. The book concludes with an exhaustive survey of Air and Water Pollution Regulations operating in the United States. These are provided as a guide for engineers in that country and unwittingly emphasize the possibility of State and Federal law coming into collision.

This volume is profusely illustrated and has a wealth of diagrams and graphs to supplement the comprehensive editorial. It is interesting to note that the editor describes it as opening the door to creative problem-solving rather than offering a set of rules to follow.

### 11th Annual Report of the Warwickshire Clean Air Council

This reports, which clearly states the aims of the Council, its history and composition has been read with interest. The Chairman, who represents the

Council at the N.S.C.A., reports steady progress towards the goal of clean air. He expresses regret, however, that financial restrictions during the year under review have produced a check to this progress because the Council's largest constituent authority has had to virtually halt its programme of smoke control.

Despite this, the Council's Publicity Group has pursued its task effectively and it is gratifying to learn that the Society's leaflet giving facts about atmospheric pollution was distributed to 382 General Practitioners in Warwickshire. In a report on Smoke Control Benefits, Mr. B. D. Allen, the Chief Public Health Inspector of Coventry shows that following the progress of Smoke Control Areas, the average smoke recorded in Coventry is 36 per cent less than in 1960. Levels rose until 1963 since when there has been a dramatic drop—when, as Mr. Allen says,"smoke control and other air pollution control measures started to bite." The steady decline in sulphur dioxide since 1960 is also very encouraging.

Mr. Allen is also the Council's Press Officer and it is clear that he has had a busy and interesting time. He says "One case involved an aggressive character who publicly attacked the local public health inspectors as "snoopers" because they had occasion to deal with people who burned coal in smoke control areas. He later withdrew his attack when it was revealed that the "snoopers" were in fact the offenders' neighbours." But a lady also responded to the attack and her letter, which is well worth publishing, reads "Mr. X doth protest too much. Does he never praise or enjoy anything? Anyone passing the perpetual stink and muck from chimneys say, of the old people's bungalows, is thankful to live in the clean air and freshness of a smoke controlled air, but some people are content to slum it for ever, and force everyone else to do likewise".

## No. 64 B.C.U.R.A. Gazette, 1968

The main item of interest in this Gazette is the text of a paper, previously unpublished, by Dr. I. G. C. Dryden and delivered to the British Association in 1949, entitled "The Present Position of the Coal Industry in Great Britain from the Point of View of the Chemist." Nearly 20 years later, this paper is still not only fresh, but also applicable—especially when considered against the background of the recent White Paper on Fuel. Dr. Dryden says "To the chemist, realizing that coal is (potentially) our chief indigenous source of organic chemicals, the almost exclusive pre-occupation of the industry with the fuel market has always proved somewhat puzzling."

The conclusions which Dr. Dryden reached in 1949 were:—

(*a*) Research directed towards new chemical industries producing high priced products (from normally a few million tons of low grade coal) should be regarded as an essential insurance policy.

(*b*) These and other secondary industries should be established in the neighbourhood of the coalfields.

(*c*) A proportion of the miners should be so trained that they can be transferred between coal production and chemical processing as required, thus helping to balance coal supply and demand.

(*d*) A further objective should be the maintenance of cheap fuel and price flexibility by such means.

(*e*) Processed coal products should be exported in preference to raw coal.

(*f*) The life of coal reserves should be extended (when opportunity offers) by sacrificing part of the fuel load to other sources of power, and compensating for this by increased attention to alternative markets.

Dr. Dryden's present-day comment is that these suggestions appear to be reasonably in line with present National Coal Board policies, and as a whole, still seem to be relevant.

### Coal Utilization Council, Annual Report for 1967

This comprehensive annual report reviews the increased activities in many directions of the Coal Utilization Council during the past year. The Council has been reorganized and streamlined, the technical service has been strengthened, and there has been a still further increase in the rate of canvassing for solid fuel in smoke control areas.

Sir John Charrington, our own President, is to be congratulated on his election as President of the C.U.C. for 1968.

The Council's technical advisory services were in ever-increasing demand, especially in the regions where, in the past year, inquiries increased by some 25 per cent. In the field of training, over 4,000 students attended C.U.C. courses during 1967, an increase of 17 per cent over the previous year.

Smoke control activities were stepped up and no less then 202,000 houses were visited by C.U.C.-organized canvassers.

To the Central Electricity Generating Board, smoke means more than impure air. It means unburnt carbon, wasted power.

At modern coal-fired power stations, over £3,500,000 is spent on clean air measures —tall chimneys and dust extraction plant.

**Better — cleaner — things are electric**

### Facts about Lead and the Atmosphere

This booklet, published by Lead Industries Association, Inc., of New York, deals factually with such questions as how much lead is in the air? How do the concentrations vary from place to place and time to time? How much lead does man breathe in? What proportion of lead in the general environment comes from the air? How much from food? How much from liquids? And what is most important what effects does it have on man?

Lead is defined as an essential metal and some of its important uses are specified. It is recognized that it is everywhere and that it has toxic effects. However, it is now possible to obtain sound information about lead in man, lead in the environment and to measure its effects. Most of our lead intake comes from food and drink; a very small percentage only comes from the air.

The report describes how the body handles the lead which has been inhaled, deals with measurements of lead in the atmosphere, gives detailed statistics of the findings of a survey carried out in three cities in the United States and quotes the findings of the world survey carried out by the World Health Organization of the United Nations. Average levels in micrograms of lead per 100 millilitres of blood range from 26 in Finland to seven in Peru, the figure for the United Kingdom being 23. The quantities of lead detected in the atmosphere are well below concentrations that would give concern about health to the general public. According to known medical evidence, the present levels of lead in the general environment do not present a public health problem. But the report is not complacent and emphasizes the need for the further research which is continuing.

# INDUSTRIAL and COMMERCIAL NEWS

by Michael W. Morgan

## New Dust and Smoke Monitor

Airflow Developments Ltd., High Wycombe, England, are now manufacturing a new optical probe for monitoring both dust and smoke emission in flues and chimneys. Known as the S.E.R.O.P. and developed in conjunction with the Central Electricity Generating Board, Plant Optimization Instrument Dept., South Eastern Region, the new instrument will make a valuable contribution to the community by monitoring the emission for possible atmospheric pollution, as well as giving the engineer vital information regarding combustion performance.

The S.E.R.O.P. has been specified for the new giant power station, Drax, near Selby, Yorks., as well as for the new Pembroke, King's North and Fawley power stations. Apart from power stations, the S.E.R.O.P. is suitable for industrial installations.

The S.E.R.O.P. provides a highly stable continuous signal proportional to the obscuration in the duct itself. It has adjustable sensitivity and response with two ranges, one for dust burden and the other to match the British Standard 2978 Part 1 scale for smoke.

The output from the instrument can be read on an indicating meter and full provision is made for connection to a matching recorder. Additionally, provision can be made for feeding data logging equipment.

The standard model described here may be used both for permanent installation on combustion monitoring duty, and alternatively as transportable equipment for investigations on precipitator operation, combustions optimization, etc., by testing and efficiency engineers.

The apparatus comprises a stainless steel probe, which is inserted in the flue under examination through a special mounting flange; the electronic control and indicating unit, connecting cables, and, if required, the recorder.

*The optical probe of Airflow Developments "S.E.R.O.P.", a new instrument designed for monitoring dust and smoke emission in ducts, flues and chimneys, being inserted into a flue. The connecting cables from the mounting flange of the S.E.R.O.P. are linked to the electronics unit which is housed separately in a waterproof cast case, the top of which is seen in the foreground. The output of the instrument can be read on an illuminated indicating meter, and full provision is made for connection to a matching recorder. Additionally, provision can be made for feeding data logging equipment*

### The Probe and Optical Unit

Uniquely, the probe which houses the whole optical system can be easily removed from a duct in use, zeroed and replaced in the duct in a matter of minutes.

The fact that the whole probe is mounted off a single flange from one point on the duct work ensures that the effects of duct movement or distortion are entirely eliminated, and all the connecting cables come from one point only.

The probe itself is tubular in form with longitudinal slots through which the laden gases pass. At the inner end is a 12 volt tungsten filament lamp constructed to withstand ambient temperatures up to 400°F. At the outer end of the probe, external to the flue, is a light sensitive resistance cell of particularly stable characteristics. Provision is made for keeping the temperature of this cell within its working limits.

The system of keeping the optical components clean is novel and is the subject of patent applications both in the U.K. and abroad. At both ends of the probe, protecting the lamp and the cell, are flat helical labyrinths, each having an unimpeded path for the light down its centre. Dust laden gas movement is so retarded by the labyrinth assisted by a small air bleed as to inhibit particles from passing along the light patch. The advantage of this design is that a wide tolerance is permissible in the alignment of the optical members and any distortion due to heat does not affect the calibration of the instrument.

### Electronics Unit

The fully transistorized electronics unit is accommodated in a weather-proof case and comprises a special voltage stabilized power pack providing a controllable D.C. voltage to the probe lamp and a linear amplifier; low voltage A.C. outputs are also provided for auxiliary circuits.

The linear amplifier is fully compensated and gives an output of 1 MA FSD proportional to obscuration. Selector switches enable the operator to choose to measure dust burden on high or low gain ranges on a linear characteristic or to measure smoke on an expotential characteristic matching the B.S.2978 Part 1 smoke scale. Calibration is effected with the probe out of the duct but shrouded, using standard neutral density filters.

## Fordust Smoke and Dust Monitor

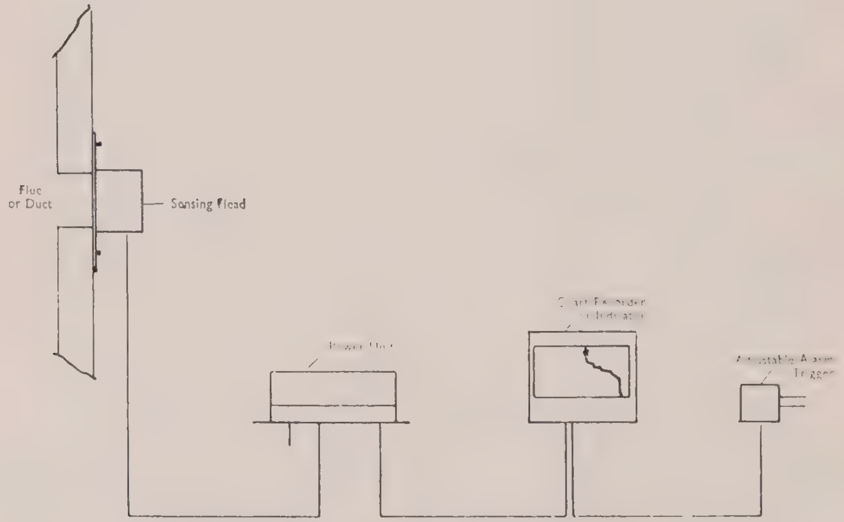
Wesglade Electrics Company have designed, with a view to long term reliability and ease of maintenance, the "Fordust" smoke and dust monitor.

Smoke monitoring equipment usually works on the obscuration principle by means of a light beam across the duct, requiring an aperture on each side, one for the light source and one for the receiver. These two units must be retained in perfect alignment to maintain accuracy, and access is required to both sides of the duct for lens cleaning and other maintenance.

The "Fordust" obviates these requirements by using back scatter from the smoke or dust particles as a measure of the amount of material in the duct. This use of the photo-electric cell's most sensitive range, and, unlike obscuration devices, can be used on ducts of large widths.

The supply for the light source is stabilized to provide constant light output, and the photo-electric cell is compensated for variations in temperature. Because of the large airflow past the cell, its temperature is virtually that of the outside air.

*The Fordust Smoke and Dust Monitor. The "Fordust" technique using only one aperture completely eliminates alignment problems as the structure is mechanically rigid within the photo head. Cleaning of lenses is achieved by hinging back the photo head and sliding out the lenses which are automatically located in their correct positions when replaced*



SIMPLE SCHEMATIC DIAGRAM OF A TYPICAL INSTALLATION

The cell output is fed to a stabilized high-gain amplification system which is provided with pre-set zero and gain controls. The gain control allows the user to set the "Fordust" to give full scale deflection on the recorder for any suitable level of smoke and dust according to the requirements of the particular system.

The standard instrument is suitable for use with a 0-1 ma FSD moving coil stripchart recorder, but other outputs may be supplied to special order.

An alarm unit is available which may be set to trigger between 10% and 100% of FSD on the recorder.

Standard mains input is 110 volts or 240 volts 50 cycles but different mains voltages may be supplied to special orders.

Approximate overall dimensions:—

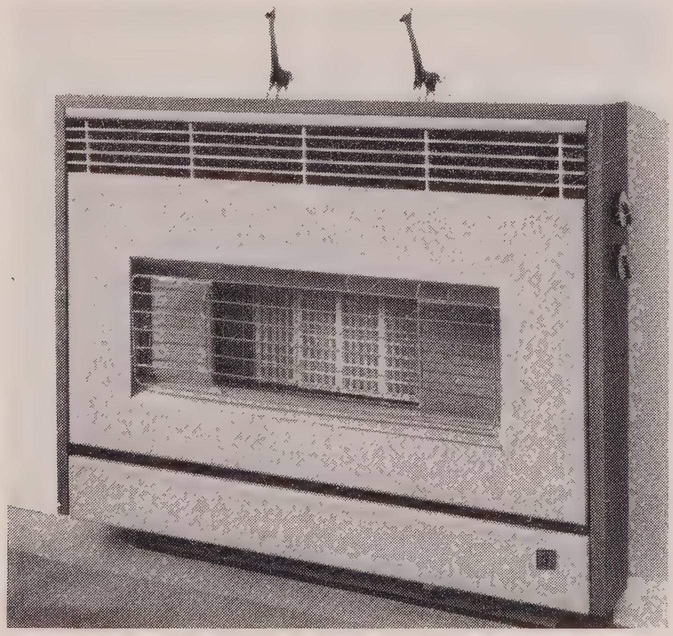
| | |
|---|---|
| PHOTO HEAD MOUNTING PLATE | 12″ (305 mm) x 10″ (245 mm) |
| SENSING HEAD – – – – | 3″ (76·2 mm) x 3″ (76·2 mm) x 4″ (102 mm) |
| POWER UNIT – – – – | 11″ (279·4 mm) x 5″ (125·2 mm) x 5″ (125·2 mm) |
| RECORDER (Optional) – – – | 7⅛″ (181 mm) x 7⅛″ (181 mm) |

Approximate Power Consumption 25 watts + Recorder.

## The Portway Inset Trio

The Portway Inset Trio manufactured by Charles Portway & Son Ltd., of Halstead, Essex, provides heat for the house in three different ways. The heating unit is installed in the lounge where it provides radiant heat together with a visible glowing element to act as the focal point for the room. Convected heat is also producted in quantities far in excess of those needed for the one room. Heat is drawn by a fan through the wall and into the hall, where it rises up the stairwell, providing background warmth for the remainder of the house. Cool air enters the room through a grille at high level for re-heating without draughts. Domestic hot water and a small radiator can also be run from the Trio, using a normal indirect cylinder.

The unit has a variable flame control giving between 1800 Btu/h and 17,000 Btu/h at an overall operating efficiency of between 75% and 78%.



*The Portway Trio Inset which has just been selected for the Design Centre.*

## Staples Install New Wood-Waste Burning Plant

An order for Saxlund automatic wood-waste burning equipment has been placed by Staples & Co. Limited, of Edgware Road, N.W.2, with Stewart Automatic Boilers Limited, of Leatherhead, in order to reduce fuel, transport and labour costs.

The new plant is being built round an existing boiler installation of 3,000,000 b.th.u./hour capacity, and utilizes the present system of waste extraction from the factory to a hopper near the boiler. But, whereas previously the boiler was stoked manually—causing both expense and smoke problems—the wood chips will now be fed automatically, at a governed speed, to a smokeless incinerator beneath the boiler.

Staples & Co., whose best-known products are bedsteads, bedding, and Ladderax unit furniture, produce approximately 60 cubic yards of wood-waste per week. In winter this has been burnt to provide about 70% of the fuel needs for space-heating the factory, the remaining fuel requirement being made up by oil which fires a separate boiler; in summer the wood-waste has been loaded into lorries for disposal. Stewart Automatic Boilers claim that the new installation will not only be smokeless, but by increasing the year-round efficiency of wood-waste burning, will considerably reduce the winter cost of fuel oil and make a substantial saving in the summer transport bill.

The new installation consists of a 70 cubic yards capacity storage silo, where the wood chips are agitated by three spring steel stirring arms to prevent "bridging" or build-up of compacted materials. The chips fall into a worm screw conveyor, and thence by gravity feed through a rotary valve to the stoker worm screw. The chips are then impelled under and into the fuel heap in the Saxlund furnace retort, where a supply of primary air at this level and secondary air at the top of the heap ensure complete smokeless incineration. The rate of burning is governed by thermostatic control, and an automatic sprinkler system is incorporated at three points in the feed mechanism. For dissipating unwanted heat in summer, waste heat radiators will be mounted externally.

## Economical Whole House Heating For All

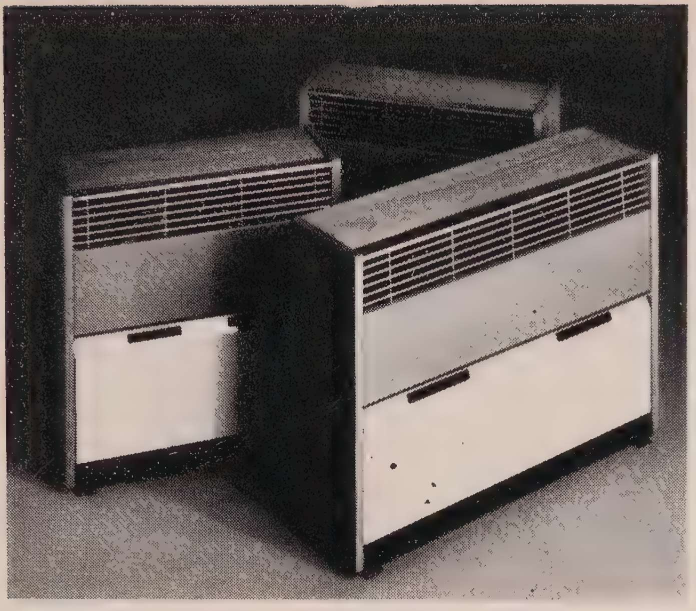
Valor Engineering Limited have introduced a range of portable oil heaters which provides a system of whole house heating for, and acceptable to, all income levels.

The models range from sophisticated units with a furniture content which have been specially designed for heating large or small areas in the home, to more conventional models including heaters for home extensions, garages and greenhouses.

With this form of whole house heating there is no installation cost or installation inconvenience as the heaters are self contained. There are no big quarterly bills and no storage tanks as the heaters carry their own fuel—oil—and running costs are low and can easily be met out of nomal income.

Models 1, 2 and 3 have been specially designed with a luxury teak surround to blend with the furniture in the room.

These heaters meet the strict regulations of the B.S.I.



*Front to rear: Valor's "Module 3" (for large areas or background warmth for hall, landing and two/three bedrooms), "Module 2" (for living rooms up to 20 feet by 10 feet) and "Module 1" (for small rooms or the landing). All have the exclusive Valor automatic safety device; a teak surround treated with a polyurethane finish, olive tan upper panel blending with the hinged French grey lower panel which provides easy access to the burners and which is held in place by a spring catch*

## The Bigwood Underfeed Stoker

A block heating scheme for a municipal flats development at Brownhills, Staffs., operated on solid fuel with automatic stoking has shown a 25 per cent saving on fuel costs compared with other types of heating.

"Humphries House" on the Aldridge-Brownhills Anchor Bridge estate is 164 feet high and contains 100 flats. The heating system in the block comprises two Centrax boilers each matched with underfeed stokers manufactured by Bigwood Unicalor Ltd., of Wednesfield Road, Wolverhampton. One of the boiler-stoker units produces up to 2,250,000 b.th.u's/hour, the other putting out up to 1,500,000 b.th.u's/hour. Used singly or together, they cover the full range of the year's heating needs.

Screw conveyors in the Bigwood Unicalor Feeder mechanism take the washed beans or peas coal from the bunkers without dust, carry it underneath the floor of the boiler room, and automatically feed it upwards through the firebed. This method of firing ensures that the firebed is never blanketed by fresh fuel and always presents a surface of high incandescence, so providing maximum radiant heat to the boiler. It is also clean in operation, needing no manual work save setting feeder rates; and coupled with the 170 feet high chimney, it complies with the Clean Air Act.

In an abrasion-resistant alloy steel casing, the tough feed screw is driven by a totally enclosed motor, and there is an enclosed gearbox in which all moving parts run in oil. The control box includes a contactor starter and kindling control with a change-over switch.

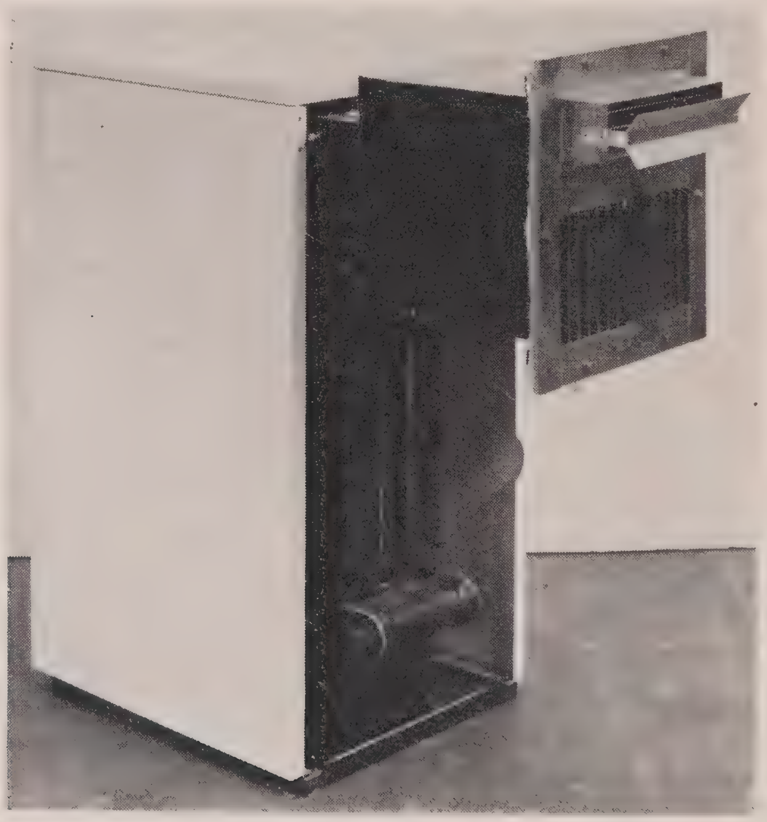
Routine maintenance takes less than two hours each day and can be done by the caretaker.

Fuel is delivered from nearby West Cannock Colliery by a conveyor vehicle which transfers the coal from the vehicle to the bunker without manual trimming. In the winter, fuel consumption is six to seven tons per week at which rate a full stock of coal in the bunkers would last about six weeks.

Ash extraction is a simple operation because of methods used in the Unicalor installation and requires only raking. As this is carried out, the ash falls through a grid on to a screw conveyor and elevator which feeds it to ash bins ready for collection.

In winter conditions, the two boiler-stoker units are used together. In the autumn and spring, the larger unit is employed on its own; and in the summer, the smaller one alone supplies hot water and background heating if required. The equipment, which provides hot water for a total of about 600 radiators, has not yet been used at over 60 per cent of its capacity.

At all times residents can be assured of a minimum living room temperature of 18°C. (65°F.) and a bedroom and circulation area temperature of 13°C. (55°F.). The heat supplied is metered and tenants, at the end of the year, receive a refund or pay an additional charge on the 15 shillings a week flat rate charged throughout the year.



*The Autogas B range of central heating boilers produced by Redfyre Ltd., of Thorncliffe, Sheffield S30 4YP, which incorporates a multi-gas burner, has now received official approval by the Gas Council. In the 45,000 B.T.U.'s/hour balanced flue small bore unit, the terminal grille is of stainless steel. Above the combustion air inlet of the terminal grille is the extended outlet for combustion products, which is fitted with a wind deflector plate. The balance chamber is finished in vitreous enamel*

## New 16-page Filter Brochure from A.A.F.

American Air Filter (Great Britain) Ltd., Bassington Industrial Estate, Cramlington, Northumberland, announce the availability of a new, 16-page brochure (Bulletin No. 248-M) on their range of Roll-O-Matic automatic renewable media air filters.

The new brochure is extremely comprehensive and provides complete details of operation and optional designs in addition to specifications, capacities and fully dimensioned line drawings.

This brochure is available free of charge on request to American Air Filter (Great Britain) Limited.

## COMPANY NEWS

**John Thompson Limited—International Combustion (Holdings) Limited—Clarke, Chapman & Company Limited**

The Boards of John Thompson Limited, International Combustion (Holdings) Limited and Clarke, Chapman & Company Limited, announce that they are examining, with the assistance of the Industrial Reorganization Corporation, means by which a merger of the three companies may be effected with a view to the rationalization and integration of all their interests.

## APPOINTMENTS

**LODGE-COTTRELL LTD.**

Mr. P. D. Taylor, F.C.A., has been appointed deputy managing director of Lodge-Cottrell Ltd., Birmingham, a member company of Simon Engineering Ltd.

Mr. Taylor has been a director of Lodge-Cottrell Ltd. since 1958 and was, until recently, finance director of Simon-Carves Ltd.

## ENQUIRIES

Industrial readers are advised that Network Liaison Overseas Limited of Sutton Coldfield, Warwickshire, have informed the Society that they would welcome information from companies engaged in producing clean air equipment. They recently received an enquiry for such equipment from Manilla in the Philippines.

# SMOKE CONTROL AREAS

## Progress Report

### Position at 30 June 1968—TOTALS

| | England | Wales | Scotland | Northern Ireland |
|---|---|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation .. | 44 | — | 1 | — |
| *Acres*, 3,400 | | | | |
| *Premises*, 41,060 | | | | |
| **Smoke Control Areas in Operation** .. .. | 2,514 | 6 | 106 | 1 |
| *Acres* .. .. .. | 628,042 | 418 | 46,636 | 380 |
| *Premises* .. .. .. | 3,335,271 | 2,352 | 275,172 | 4,417 |
| **Smoke Control Orders** | | | | |
| *Confirmed* .. .. | 265 | — | 19 | 12 |
| *Submitted* .. .. .. | 54 | 1 | 6 | — |
| **Grand Totals** .. | 2,877 | 7 | 132 | 13 |

### Smoke Control Position in Regions of England at 30 June 1968

(*Figures supplied by Ministry of Housing and Local Government*)

| (1) *Region* | (2) *No. of black area acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage* of total black area acreage in region so covered* | (4) *No. of black area premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage* of total black area premises in the region* |
|---|---|---|---|---|
| Northern .. .. | 24,353 | 19·43 | 119,455 | 21·60 |
| Yorkshire and Humberside .. | 139,936 | 37·16 | 473,997 | 40·58 |
| East Midlands .. | 44,147 | 15·42 | 143,762 | 28·09 |
| Greater London .. | 204,378 | 62·49 | 1,825,770 | 69·17 |
| North Western .. | 143,071† | 35·66 | 652,795† | 38·33 |
| West Midlands .. | 72,472 | 29·10 | 319,296 | 30·37 |
| South Western .. | 7,201 | 27·33 | 26,650 | 17·89 |
| Total (black areas) | 635,558 | 35·83 | 3,561,725 | 45·81 |
| Outside black areas | 110,237 | | 379,593 | |
| GRAND TOTALS | 745,795 | | 3,941,318 | |

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* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country).

† Excluding 25 acres and 490 premises as the Salford (Ladywell and Fairhope) Smokeless Zones Order 1954 was revoked on 24 April 1968 (Smokeless Zones figures are now 3,245 acres and 39,294 premises).

# NEW SMOKE CONTROL ORDERS

*The lists below are supplementary to the information in the last issue of* Smokeless Air (*Summer 1968*) *which gave the position up to 1 April 1968. They now show changes and additions up to 30 June 1968.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.*

## ENGLAND

## NEW SMOKE CONTROL ORDERS IN OPERATION

**Northern**

*Tyneside and Wearside*

Felling U.D. Nos. 3 and 4.

**Yorkshire**

*West Riding* (*North*)

Brighouse B. (Bridge End No. 12). Halifax C.B. No. 14. *Queensbury and Shelf U.D. No. 6. Spenborough B. No. 8. Stanley (Durham) U.D. (East Stanley No. 1). Stanley (Durham) U.D. (Lintz No. 1). Wakefield C.B. (Flanshawe No. 1).

*West Riding* (*South*)

Rotherham C.B. (Redscope).

**North Western**

*South Lancashire and North-East Cheshire*

Altrincham B. No. 6. Heywood B. No. 7A. Kearsley U.D. (Mossfield R.D.) No. 2.

*Merseyside*

Bebington B. No. 20. Liverpool C.B. No. 24. Warrington C.B. No. 10.

**Midlands**

*Derby, Nottingham and Chesterfield*

Nottingham C.B. No. 5. Sutton-in-Ashfield U.D. No. 3.

*West Midlands*

Birmingham C.B. Nos. 91, 140, 146 and 147. Dudley C.B. No. 49. Sutton Coldfield B. No. 9. Walsall C.B. No. 10.

**London**

*Greater London Boroughs*

Ealing L.B. No. 31.

**Local Authorities Outside the Black Areas**

Grantham B. No. 12. Slough B. No. 11. Staines U.D. No. 8. Winsford U.D. (Wharton Road West) No. 9.

## NEW SMOKE CONTROL ORDERS CONFIRMED, BUT NOT YET IN OPERATION

**Northern**

*Teeside*

Darlington C.B. Red Hall. Darlington C.B. Lascelles Park.

**Yorkshire**

*West Riding* (*North*)

Aireborough U.D. No. 23. Bingley U.D. No. 14. Keighley B. No. 7. Knottingley U.D. (Wentcliffe Hill). Knottingley U.D. (Hill Top). Leeds C.B. Nos. 70–72. Morley B. Nos. 36 and 37. *Rothwell U.D. No. 12.

*West Riding* (*South*)

Barnsley B. Nos. 5 and 6. Doncaster C.B. No. 10.

**North Western**

*South Lancashire and North-East Cheshire*

Bolton C.B. Foster Lane. Bolton C.B. Deane No. 2. Bolton C.B. Derby Ward No. 3. Bury C.B. No. 7. Eccles B. No. 8B and No. 9. Leigh B. No. 8. Sale B. No. 9. Salford C.B. Nos. 15 and 16. Stalybridge B. (High Street No. 2). Stalybridge B. (Set Street and Sycamore Street). Urmston U.D. No. 7. Whitefield U.D. No. 9. Worsley U.D. (Mount Skip Part 1).

*Central Lancashire*

Accrington B. No. 8. Brierfield U.D. No. 3. Fulwood U.D. No. 2. Rishton U.D. No. 1.

*Merseyside*

Liverpool C.B. No. 27. Runcorn U.D. No. 4. St. Helens C.B. No. 6.

**Midlands**

*Derby, Nottingham and Chesterfield*

Alfreton U.D. No. 2. Carlton U.D. Nos. 3 and 4. Derby C.B. No. 14. Dronfield U.D. No. 4. Mansfield B. No. 5. Sutton-in-Ashfield U.D. No. 4.

*West Midlands*

Bedworth U.D. No. 2. Birmingham C.B. No. 130. Dudley C.B. Nos. 52–54. Nuneaton B. No. 5. Walsall C.B. No. 13. Wolverhampton C.B. No. 13.

*Potteries*

Stoke-on-Trent C.B. No. 21.

**South West**

*Bristol*

*Bristol C.B. No. 8.

**London**

*Greater London Boroughs*

Bromley L.B. Nos. 7–9. Croydon L.B. No. 10. Ealing L.B. Nos. 36 and 37. Haringey L.B. (Tottenham No. 8). Haringey L.B. (Hornsey No. 10). Harrow

L.B. No. 17. Hillingdon L.B. No. 10. Merton L.B. Nos. 9 and 10. Westminster L.B. Maida Vale South.

**Outer London**
Dartford B. No. 7.

**Local Authorities Outside the Black Areas**
Basildon U.D. No. 7. Belper R.D. No. 1. Cheltenham B. No. 4. Crawley U.D. Northgate. Heanor U.D. No. 3. Oxford C.B. No. 7. Rugby B. No. 9. Seisdon R.D. No. 2. Southampton C.B. No. 7. Tamworth B. No. 2. Warrington R.D. No. 1. Winwick. Watford B. (The Harwoods No. 6). Watford B. No. 7. Whiston R.D. No. 1.

## SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**
*Teeside*
Hartlepool C.B. Nos. 13 and 14.

**Yorkshire**
*West Riding (North)*
Bingley U.D. No. 15. Elland U.D. (Stainland No. 3). Elland U.D. (Holywell Green). Halifax C.B. No. 15. Horbury U.D. No. 6. Horsforth U.D. No. 27.
*West Riding (South)*
Sheffield C.B. No. 19.

**North Western**
*South Lancashire and North-East Cheshire*
Altrincham B. No. 7. Bolton C.B. (Moorfield and Firwood). Prestwich B. No. 8. Westhoughton U.D. No. 4. Wigan C.B. No. 5.
*Central Lancashire*
Burnley C.B. No. 10.
*Merseyside*
Bebington B. No. 12. Huyton-with-Roby U.D. No. 5.

**Midlands**
*Derby, Nottingham and Chesterfield*
Hucknall U.D. No. 2. Sutton-in-Ashfield U.D. No. 1.
*West Midlands*
Sutton Coldfield B. Nos. 11 and 12.

**London**
*Greater London Boroughs*
Bexley L.B. No. 9. Ealing L.B. No. 38. Islington L.B. Nos. 28 and 29. Merton L.B. No. 11.

**Local Authorities Outside the Black Areas**
Meriden R.D. No. 3. Norwich C.B. No. 1. Reading C.B. No. 12. Ripley U.D. No. 1. (Hartshay Hill). Todmorden B. No. 7. Warrington R.D. No. 2. Whiston R.D. No. 2.

## SCOTLAND
## NEW SMOKE CONTROL ORDERS IN OPERATION

Coatbridge (Townhead). Falkirk No. 6. Paisley (Millarstone / Castlehead / Brodie Park). Stirling County (Carron, Carronshore, Skinflats).

## NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Alloa No. 1. Coatbridge (Greenend). Coatbridge (Barrowfield).

## NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Barrhead (Waulk Mill). Hamilton (Fairhill/Laightonstonehill). Lanark County (Bankhead). Lanark County (Blantyre West). Paisley (Williamburgh/West End).

## NORTHERN IRELAND
## NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Antrim R.D. No. 1. Craigavon No. 1. Lurgan B.C. No. 1. Newtownabbey U.D. Nos. 1 and 2. Portadown B.C. Nos. 1 and 2.

## ERRATA TO THE CLEAN AIR YEAR BOOK 1968-1969

We apologize for some inaccuracies in the table of smoke control areas in the Clean Air Year Book and should like to publish the following corrections:—

### ENGLAND

| | *Acreage in Operation 1.4.68.* | *Premises in Operation 1.4.68.* |
|---|---|---|
| Hartlepool C.B. | 1,769 | 5,535 |
| Walsall C.B. | 2,600 | 9,096 |
| Lincoln B. | 1,389 | 1,477 |
| Mold U.D. | 137 | 578 |
| Seisdon R.D. | 1,049 | 145 |

### SCOTLAND

| | | |
|---|---|---|
| Port Glasgow | 275 | 1,590 |

# DEALING WITH AIR POLLUTION IN WEST BROMWICH

The very comprehensive 1967 annual report of the Hygiene and Cleansing Department covers all the Department's many and varied activities. But our interest is centred on that portion which deals with air pollution. A large county borough with a high proportion of industry, West Bromwich has a number of problems in the air pollution field; some of these are peculiar to West Bromwich, others are of interest to all those concerned with the promotion of clean air in our larger towns. The relevant parts of the report are therefore reproduced below:

As with any industrial town West Bromwich has a basic environmental problem to contend with, principally, the close proximity of old terrace type dwellings to industry, in many cases of the heavy iron foundry type. In such circumstances it is often difficult to resolve completely, problems giving rise to complaints of dust, grit, smoke, fumes or noise from nearby residents. Such situations are caused more by bad original planning than default on the part of factory managements. In these cases the Public Health Inspector has to act as an arbiter of the nuisance and use his judgement in effecting in each case the most satisfactory compromise which can be obtained.

### Industrial Air Pollution

As much time as possible was spent inspecting boilers, furnaces and other plant capable of causing air pollution, regardless of whether complaints had been received or the particular installation was producing visible smoke. Considering the large amount of industrial air pollution, remarkably few complaints are received and one can only assume that the bulk of the public have come to accept it as inevitable. Every opportunity is taken when speaking with managers, engineers and boiler operators to stress the importance of fuel efficiency for if one can reduce the amount of fuel being burned the quantity of pollutants discharged must inevitably also be reduced.

The Fyrite $CO_2$ indicator and flue-gas thermometer purchased in 1966 proved extremely useful. We have been able to assist a number of firms in eliminating smoke emissions and improving combustion after testing flue gases for carbon-dioxide and temperature.

The position at the end of the year regarding cold blast cupolas, certainly one of the most noticeable sources of air pollution, was as follows:—

| | |
|---|---|
| (*a*) Cupolas in regular use and fitted with wet arrestors | 51 |
| (*b*) Cupolas in regular use without wet arrestors | 33 |
| (*c*) Cupolas not in regular use or on sites awaiting redevelopment | 20 |
| Total | 104 |

The report of the Working Party set up by the Minister of Housing and Local Government in 1964 to study emissions from Iron Foundries has still to be published. The report of the Working Party on Dust and Grit Emissions has been published and in a general sense is referred to later. However, it is worth noting here, that this second Working Party were unable to recommend standards of emission for cupolas as they did not think sufficient was known about the various problems. Accordingly the Working Party recommended "that the Ministry should initiate a systematic study to obtain emission data from a representative sample of these classes of furnaces and, at the same time, get some reliable information on current technology of emission prevention".

Observations and inspections made during the year have also confirmed that the knock-out, fettling and shot blasting processes at iron foundries are sometimes the cause of nuisances blamed on cupolas. The generally accepted method of dealing with these processes is to filter and exhaust through bag filters, occasionally discharging the gases over a covered water bath before being allowed to escape to the atmosphere. Providing the area of bag filter is adequate to deal with the rate of air flow from the particular process these filters are capable of high collection efficiencies. The principal difficulty is that regular maintenance (e.g. shaking of the bags, ensuring no bags have burst, etc.) is essential otherwise the efficiency falls off rapidly and nuisance arises.

## Spring Making in West Bromwich

After the survey of iron foundries was completed attention was turned to spring making. The making of springs is a traditional industry in West Bromwich, possibly associated with lock making in Willenhall where Queen Elizabeth I granted a Charter conferring the privilege of making all locks required in the Royal Palaces. It is natural, therefore, that in continuing our survey of the main industrial sources of pollution that we should turn our attention to this industry which employs 4,500/5,000 people.

There are 27 firms involved, ranging from one-man businesses, to some of the largest manufacturers in the country and of high international repute. They are not operating from any particular quarter of the town but are scattered widely over the whole area. Together they manufacture springs of every kind and size from those required for railway wagons to springs for motor vehicles, precision instruments, and the tiny springs found in electrical fuses. The latter are so small that it is possible to put over 1,000 of them into a thimble and the steel wire from which they are made is only 0·008 inches in thickness.

From the air pollution aspect the industry presents few problems, compared for example with iron foundries. The source of heat for the hardening, tempering and annealing of the metal varies, but generalizing, electricity is used for small work, coal gas for medium to heavy springs and fuel oil for very heavy work. The principal fuel used by the 27 firms is indicated in the following table, many firms of course use more than one type of fuel:—

| *Fuel* | *Number of Firms* |
|---|---|
| Coal Gas | 15 |
| Electricity | 6 |
| Fuel Oil | 3 |
| Liquified Petroleum Gas | 2 |
| Coal | 1 |
| | 27 |

The largest factories with their multitude of comparatively low level discharges of combustion products from fuel oil and coal gas, give most cause for concern. Fuel oil is capable of producing dark smoke when incorrectly burned and it will always contain some sulphur, which is the main hazard. Sulphur dioxide and sulphur trioxide are present in combustion gases however efficient the process of burning may be and combination with water or water vapour, which are always readily available, produces suphuric acid. This is one of the most corrosive and dangerous of pollutants, capable of doing serious damage to buildings, vegetation, fabrics, and metal work, to say nothing of the effect on the human lung. Other products of combustion arising from both oil and coal gas include oxides of nitrogen, aldehydes, hydrocarbons, etc., and although they cannot be so readily linked with danger to health and property, medical research workers are confident that they are harmful when discharged at low level. This pollution is not peculiar to spring making however as any factory with a large number of oil and/or gas fired furnaces presents the same problems. Firms have been requested whenever the opportunity occurs to combine the flues of furnaces, making the use of a higher chimney more economical and reducing the maximum ground level concentration of pollutants. The solitary manufacturer burning bituminous coal produces some smoke and at present consideration is being given to the use of coal gas or oil as an alternative fuel.

The only other aspect of spring making that can give rise to nuisance is the fumes which rise from the oil quenching of the heated springs. Oil is not as good a conductor of heat as water, hence its use as a quenching agent allowing for slightly slower cooling of the hot steel and providing a finished product which is not brittle. It is interesting to note that up to some five years ago practically all the spring makers used whale oil for quenching, simply because it had a comparatively high flash point of around 550°F. This whale oil has now, on the grounds of cost and advancing techniques in refining mineral oils, been replaced by mineral oils or blends of mineral oils and whale oil. The fumes from oil quenching do not, however, present the same pollution problems as the combustion of fuel oil. Whale oil contains no sulphur of course, and the mineral oils have a maximum sulphur content of 0·2 per cent in comparison with heavier fuel oils which contain as much as 4 per cent sulphur.

The light grey fumes from oil quenching can, however, be so dense, particularly if the premises are sited in a Smoke Control Area, as to make some form of treatment essential. An effective method already used at some factories for dealing with this particular trouble, is to burn off the fumes in a gas-fired after-burner. This treatment has been recommended to all the manufacturers with similar troubles.

## Other Pollution Complaints

Complaints of all types of pollution have been investigated and in some cases after months of work we have still not been able to identify the cause of the trouble. However, work is proceeding and each year shows some improvement in the general industrial air pollution picture. Advances are too numerous and small to enumerate when considered against the background of the whole Borough. However, three of the types of improvement which bring satisfaction to those working in this field and make life a little more bearable for people living in the vicinity are:—

(1) A new oil-fired annealing oven in the worst polluted area of the district.

This has replaced an old pulverized fuel fired oven which emitted smoke, grit and dust more or less continuously.

(2) The replacement of a cola blast cupola by an oil-fired melting furnace. This particular furnace will melt over 1 ton an hour but the manufacturers are capable of producing similar furnaces which melt 3 tons of iron per hour. This could be an important breakthrough in reducing grit and dust emissions from small foundries.

(3) The installation of a properly designed oven for burning the insulation off scrap cable. This work was previously carried out in the open producing considerable quantities of smoke and fume.

### New Furnaces—Sections 3 and 10, Clean Air Act 1956

Section 3 requires all new furnaces (except domestic furnaces rated under 55,000 BTU/HR) to be capable of being operated continuously without emitting smoke while burning fuel of a type for which they were designed. It is also an offence to install a new furnace without previously notifying the Corporation and a person may submit plans and specifications together with a request for approval. If the Corporation give their approval to a proposed installation the installation is deemed to comply with the provisions of this Section.

Section 10 controls the height of chimneys other than those of residences, shops and offices. When the plans of a new building which are submitted in accordance with the Building Regulations show it is proposed to construct a chimney, the plans must be rejected unless the Corporation is satisfied that the chimney will be of a height sufficient to prevent, as far as practicable, smoke, grit, dust and gases from becoming prejudicial to health or a nuisance.

The chimneys and flues of other fuel burning installations are governed by the various Building Regulations.

All plans deposited with the Borough Engineer in accordance with the Building Regulations are examined and when applicable, new chimney heights are usually agreed along with prior approval under Section 3, as set out above.

The number of notifications received during the year of intention to install new furnaces were 46 and 41 applications for prior approval were received.

Notifications and applications were in respect of the following plant:—

| | |
|---|---|
| 2 | Cold Blast Cupolas |
| 3 | Incinerators |
| 2 | Annealing Ovens |
| 6 | Heat Treatment Furnaces |
| 62 | Boilers and Heating Furnaces. |

The two cupolas were of course heated with metallurgical coke, of the remaining 72 furnaces, 46 were oil-fired and 26 gas-fired.

The number of notifications has increased considerably over the past two years but there are still a number of furnaces being installed without notification. This is really the beginning of "Clean Air" in the industrial field as it is obviously easier to ensure that new installations are capable of being operated with the minimum of air pollution than to find the furnaces once they are installed and working.

As a routine, conditions are attached to prior approval, they normally include, minimum chimney height, minimum efflux velocity, method of installation and operation to be to our satisfaction and the testing of the installation on completion for $CO_2$ in the flue gases, flue gas temperature, draught and where necessary the Bacharach smoke number. The Bacharach smoke number is only used when testing oil-fired boilers or furnaces. A specified quantity of flue gas is withdrawn and passed immediately through a small section of filter paper. The minute particles of carbon or smoke in the flue gas are deposited on the filter paper and the pale grey to black stain made by these particles is compared against 10 standard stains. When smoke is just visible at the chimney top the stain is equivalent to No. 6 on the standard scale. Smoke of a density equal to Ringelmann 2 at the top of the chimney is equivalent to No. 9 on the scale.

This test is only of value with gas oils and light fuel oils and is not 100 per cent reliable alone. It must be used in conjunction with $CO_2$ readings and flue gas temperatures.

### Grit and Dust Arrestment

In August, the Ministry of Housing and Local Government circularized all local authorities calling on those in particular black areas "to review all causes of grit and dust and take all practicable steps to get the emissions reduced to acceptable limits". Standard levels of grit and dust emission were recommended in a booklet which accompanied the circular. The standards were based upon the report of the Working Party on Grit and Dust Emissions and the Ministry have announced their intention of making Regulations to deal with the problem.

Arrangements were being made at the end of the year by the City of Birmingham in conjunction with the West Midlands Clean Air Advisory Council for a course of training in grit and dust measurement to be given to a small number of Public Health Inspectors from large industrial areas by the National Industrial Fuel Efficiency Service. It is probable that the Senior Public Health Inspector in charge of the air pollution section will attend this course.

### Domestic Smoke Control

At the end of 1967 there was a total of 10,759 dwellings included in 21 Smoke Control Areas.

The West Bromwich Smoke Control Order No. 16 covering 363 dwellings in Great Barr became operative on 1 July. Although one could not claim that this area is in any way representative of the remainder of the Borough the facts which emerge are of interest.

Out of the 363 households, 193 were eligible for a grant and the average total cost per house, where grant was claimed, amounted to £20. Of the houses where fireplaces were eligible for complete conversion (N.B. a number of properties were fitted with underdraught fires and a small alteration was all that was required) 42·9 per cent opted for solid fuel, 54·4 per cent for gas and 2·7 per cent for electricity. It is also worth noting on completion, that fuels were being burned in the following proportions over the area as a whole:—

| | |
|---|---|
| Solid smokeless fuels | 39·5% |
| Gas | 48·3% |
| Electricity | 11·8% |
| Oil | 0·4% |

### Contravention of Section 11. Clean Air Act 1956

It was necessary during the year to write to 41 occupiers of houses in smoke control areas reminding them that it is an offence to emit smoke from their chimneys unless they were burning one of the "authorized fuels" at this time.

### Clean Air—What will it cost?

In an endeavour to find the answer to the above question as it related to the conversion of the remainder of the Borough to complete smoke control, a sample survey was carried out in the early part of the year, mainly by Pupil Public Health Inspectors.

The survey was performed in accordance with the method described in the Ministry of Housing's Report "Our Older Homes" and involved visits to over 1,000 properties. Findings of the survey included:—

(*a*) 40 per cent of the Council dwellings inspected already complied with smoke control requirements.

(*b*) 33 per cent of the Private dwellings inspected already complied with smoke control requirements.

In the above properties, a large proportion of adaptations had been carried out outside the auspices of smoke control, work having been done either on the tenant's or owner occupier's own initiative. The varying choice of appliances was interesting as this gave an indication of individual preference between varying fuels as follows:—

| | Council Dwellings | Private Dwellings |
|---|---|---|
| Solid Fuel | 39% | 27% |
| Gas | 46% | 51% |
| Electricity | 14% | 21% |
| Oil | 1% | 1% |

It was calculated that to carry out complete smoke control for the 1,000 properties surveyed would cost £23,287 and that as there were 50,000 dwellings within the Borough the sum total of smoke control expenditure in theory should therefore be 50 × £23,287=£1,164,350. However, the survey showed that the expected rate of conversion of fire-grates at the initiative of the householder irrespective of smoke control measures would be at least 3·5 per cent per annum in private dwellings and 1 per cent per annum in Council dwellings. Experience had also shown that a small proportion of private householders would not apply for grant even though entitled to do so.

Deductions were made in the total gross cost figure to allow for these factors, balanced by a 10 per cent adjustment to allow for future rising costs of appliances. The final costs for complete smoke control were thereby estimated to be £785,300 involving over 20 years a net expenditure annually to the Hygiene and Cleansing Committee of £12,000 and £6,000 to the Housing Committee after receipt of Ministry of Housing and Local Government grant proportions.

### Future Smoke Control Areas

As a result of the survey a scheme was approved by the Council in principle to carry out smoke control over the part of the Borough not already covered, by means of 20 areas comprising approximately 2,000 properties in each. One area to be represented to the Ministry for confirmation and one to be operative each year.

### West Bromwich Smoke Control Area No. 17

One area, designated No. 17, was adopted as the first to be tackled on the basis of 2,000 properties each year. A survey was carried out and the area submitted to the Ministry of Housing and Local Government in November for confirmation.

Area No. 17 comprises the following:

| | |
|---|---|
| 356 Acres | |
| 7 | Industrial premises |
| 63 | Commercial premises |
| 1801 | Privately owned dwellings |
| 190 | Council dwellings |
| 21 | Other premises |
| 2082 | |

**Private Dwellings**

Estimated total cost of works eligible for Grant—£49,618.

**Council Dwellings**

Estimated total cost of works eligible for Grant—£4,039.

The total net cost of this area as estimated from the detailed survey carried out is £17,309 to the Hygiene and Cleansing and Housing Committees.

The random survey carried out earlier in the year had shown expected net annual costs to the two Committees to be £18,000 for areas of this size thus indicating that the survey was reliable and that as a "rule of thumb" estimate, an average cost of £16 per house in an area, as distinct from the average cost of work at premises requiring adaptations, is realistic.

**West Bromwich Clean Air Council**

The Clean Air Council was formed in 1957 with the intention of bringing together people who have a common interest in Clean Air. It has always been fairly well supported but in 1967 efforts were made to get speakers on topics of particular interest to persons working or living in an industrial area such as West Bromwich.

On the 28 July, 18 members enjoyed a very pleasant and instructive visit to Berkeley Nuclear Power Station, Gloucestershire. When commissioned in January 1957, Berkeley was the first Nuclear powered Generating Station in the world and although small by current standards it provided a most interesting comparison with conventional coal-fired stations.

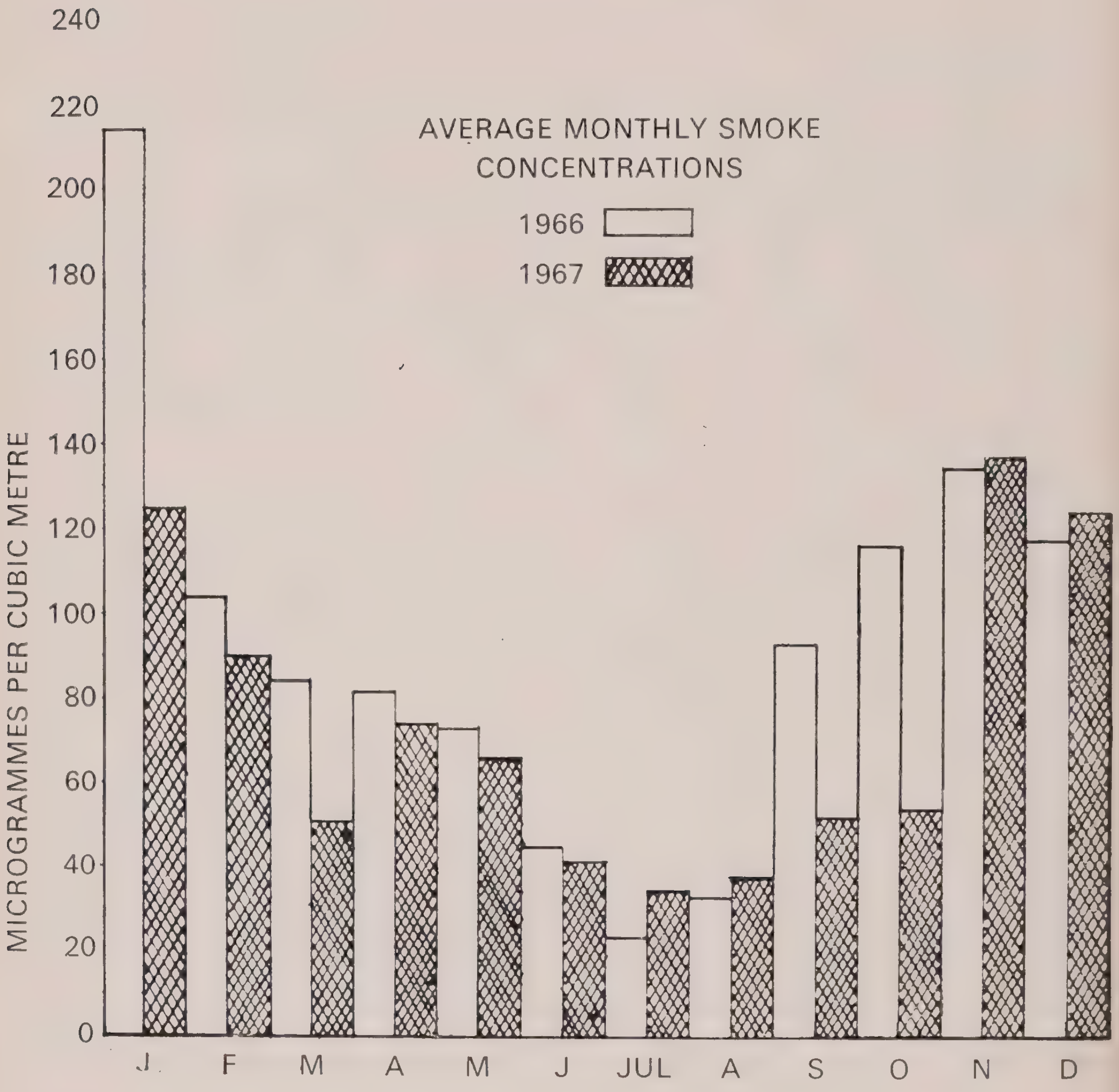
The Annual General Meeting was held on 18 September at the Midlands Electricity Board's Showrooms, High Street, with the election of the following Officers:

Mr. A. Dudley (Messrs. George Salter & Co. Ltd.) (Property and Services Engineer) — *Chairman*
Councillor E. Clarke (Chairman Hygiene & Cleansing Committee) — *Vice Chairman*
Mr. S. Cayton (Chief Public Health Inspector) — *Press Secretary*
Mr. C. R. Cresswell (Senior Public Health Inspector Air Pollution) — *Hon. Secretary*

Mr. Cayton gave his report on the year in West Bromwich after which Mr. A. W. Rooney, Senior Fuel Development Engineer, Shell-Mex & B.P. Limited, gave a talk on "Boiler Stacks Solids and Cupola Emissions". Over 45 members attended and the discussion which followed Mr. Rooney's talk was both vigorous and lively.

Finally, on 5 December, again in the M.E.B. Showrooms, Mr. B. S. Hender, Chief Design Engineer, Austin Crompton Parkinson Vehicles Limited, spoke on "Modern Battery Electric Vehicles". Mr. Hender made use of numerous slides and a film to illustrate the points he wished to make. After the talk and considerable discussion, Mr. Hender demonstrated various batteries and electrically operated vehicles and members themselves were given the opportunity to drive a small electric car.

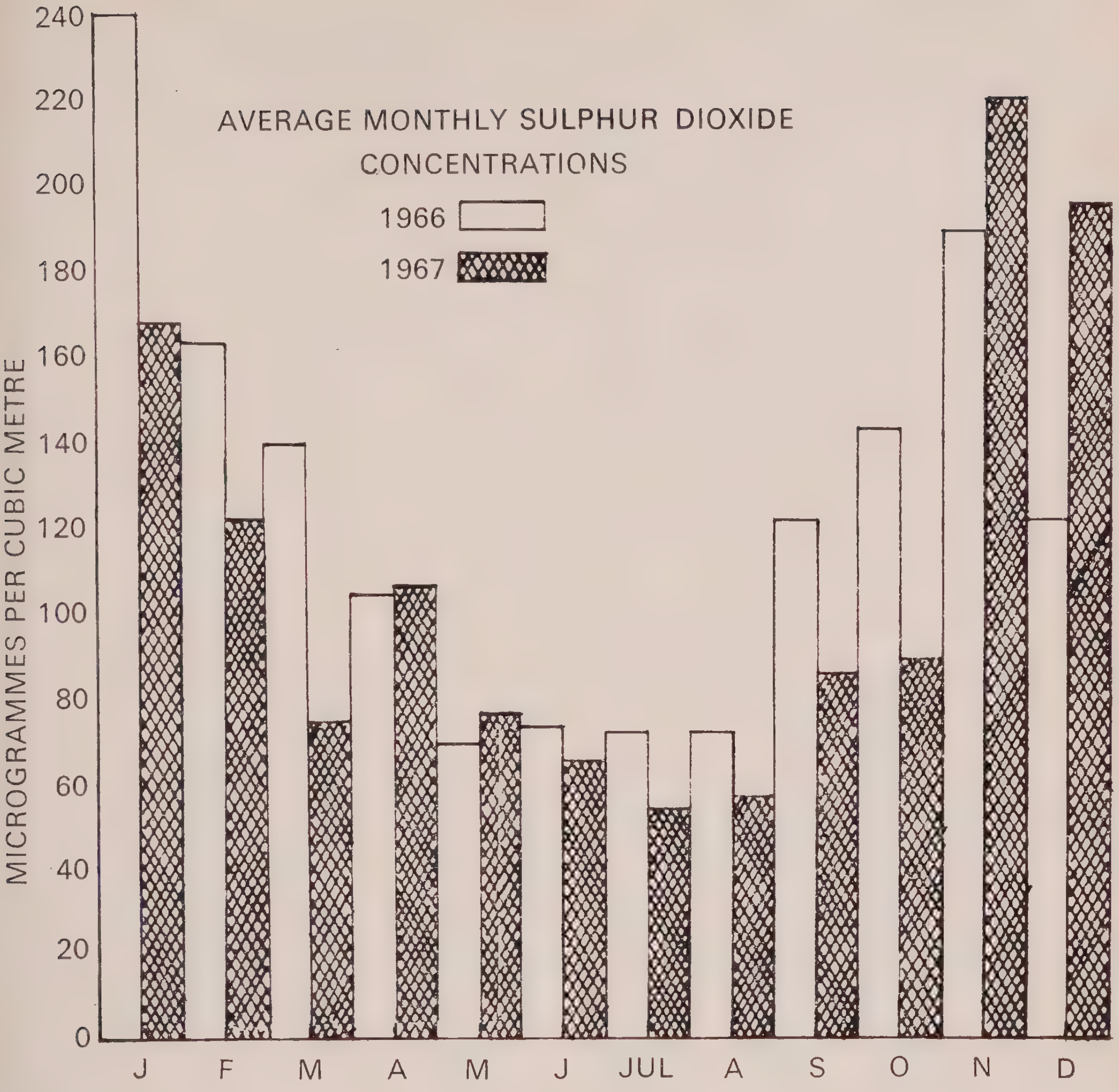
This meeting was attended by a record number of over 50 members.



## Measurement of Atmosphere Pollution

Measurement of smoke and sulphur-dioxide concentrations continued at eight sites within the Borough during the year. A single-port set of measuring equipment being employed at each site.

The average monthly pollution figures for the whole Borough are shown in the form of two block graphs, smoke concentrations and concentrations of sulphur dioxide, comparisons being made with the figures for 1966.



**Alkali Etc. Works Regulation Act 1906. Clean Air Act 1956—Section 17. The Alkali Etc. Works Order 1966.**

The Alkali Etc. Works Regulation Act 1906, is concerned with the regulation of processes carried out in certain chemical and industrial works which are specified in the Act, as extended by subsequent Orders. The Alkali Act requires these works to be registered annually with the Ministry of Housing and the "best practicable means" must be used for preventing the escape of any noxious or offensive gas, and for rendering such gas as is discharged, harmless and inoffensive. In this context "practicable" has a special meaning and includes, amongst other things, the financial implications and the current state of technical knowledge.

Because of the nature of the work carried out at these premises they are particularly liable to give rise to nuisances and many of the complaints of industrial air pollution received relate to premises registered under the Act.

The District Alkali Inspector and his colleagues inspect the premises regularly but quite often there is no complete solution to the problem.

The premises in West Bromwich which are registered can be classified into the following groups:

| | |
|---|---|
| Electricity Works | 1 |
| Chemical Manufacturers | 2 |
| Aluminium Works | 5 |
| Copper Works | 4 |
| Gas Works | 2 |
| Tar Works | 1 |
| Iron and Steel Works | 6 |
| Aldehyde Works | 1 |
| Metal Recovery Works | 1 |
| | 23 |

# *Air Pollution Abstracts*

**1071. Injury by Sulfur Dioxide, Hydrogen Fluoride, and Chlorine as Observed and Reflected on Vegetation in the Field.** Hindawi I. J. (J. Air Poll. Contr. Ass., May 1968, **18** No. 5. 307-312). Plants were examined at three different locations in the eastern part of the United States to determine whether damage from air pollution had occurred. This paper discusses sulphur dioxide damage in the metropolitan New York City area; hydrogen fluoride damage near a glass-fibre manufacturing plant in the midwest; and hydrochloric acid mist and chlorine damage from a manufacturing operation in an eastern state. The symptoms that developed in vegetation were often found to be similar. Chemical and microscopical analyses were helpful in diagnosing the toxicants.

**1072. Air pollution Emission from Jet Engines.** Lozano E. R., Melvin, Jr., W. W. and Hochheiser. (J. of Air Poll. Contr. Ass., June 1968 **18** No. 6. 392-394). Pollution emissions from three representative types of jet engines were determined. Pollutants measured included nitrogen oxides, aldehydes, carbon monoxide, hydrocarbons, and odours. A method is presented for determining the magnitude of pollution emissions due to commercial jet aircraft operation by using basic emission factors.

**1073. Variations in constitutional reactivity and in the state of children's health with relation to pollution of communal air.** Antal A. et. al. (in French) (Atmos. Environ. **2** No. 4 383-392). In Roumania, various clinical, medical and scientific investigations have been made into the constitutional reactivity in children from two cities where the atmosphere was polluted in different degrees. Variations were observed in organism reactivity, reflecting a worse state of health in children from the strongly tainted city. (Increased morbidity, weaker development, etc.)

The differences between the results being statistically valid and reflecting similar tendencies in favour of children from the comparatively clean city, it is a considered opinion that tainted communal air has a harmful influence on children's health.

It is proposed to follow up by periodic investigations the state of the children's health in order to be able to appreciate the evolution.

**1074. Stirling Engine Could Cut Motor Pollution.** (Sci. J., June, 1968 **13** vol. 4. (L). EINDHOVEN: A team of Dutch engineers has developed a Stirling engine which produces far lower concentrations of harmful exhaust gases than do comparable petrol or diesel engines. In fact the amount of toxic exhaust products produced by the new engine is well below the stringent motor pollution level set by the State of California. With its built-in advantages of low vibration, quiet running and high efficiency, the Stirling engine would thus seem ready to play a wider role in urban transport and in other areas, such as mining, where exhaust toxicity has a special significance.

Unlike the conventional diesel or petrol engine, where combustion is discontinuous, the fuel in the Stirling engine is burned continuously between the hot walls of the burner, making use of a certain amount of surplus air. This permits virtually complete combustion and consequently the amount of carbon monoxide and hydrocarbons escaping to the atmosphere is extremely low. The Stirling engine will also work on a wider variety of fuel than can petrol or diesel engines. This means that the poisonous lead components needed in petrol engine fuel can be dispensed with. (WS)

**1075.** (Engineering, March 1968, **349,** vol. 205.). (L). Air pollution from engines is to be studied under a £4,500 contract awarded by the Science Research Council to Loughborough University of Technology. The aim is to eventually design a petrol engine with good optimum performance, in this case by reducing air pollution with minimum loss of power and efficiency—and with a minimum of special appendages. (WS)

**1076. Sulphur and SO; Analysis.** (Can. Min., J., Feb. 1968. **207.** (L). It is reported, inter alia, that the Barringer A.I.S.I. sulphur dioxide monitor does not require a sample of the gas for analysis but is simply pointed into the furnace and the sulphur dioxide level is recorded on an analogue recorder, clearly defining the process end point. The instrument has many other unique roles in the field of air pollution monitoring. Use in detection of sulphur dioxide emitted by sulphide ore bodies is being considered. (WS)

**1077. A sodium-sulfur secondary battery.** June 1968. Kummer J. T. and Weber N. S.A.E. (Soc. Automotive Engrs.), Preprint, 7 pp. (1967). (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967. Paper 670179). A sodium-sulphur secondary battery has been devised which shows promise as a power source for electric vehicles by virtue of superior energy and power densities and use of cheap, light reactants. The cell is a sealed low pressure device operating at 300°C. in which liquid reactants are separated by a novel solid ceramic electrolyte permeable only to sodium ions. (APCA)

**1078. Prediction of effectiveness of gas cleaning methods at high temperatures and pressures.** Strauss W. and Lancaster B. W. (Atmos Environ. Mar. 1968. **2,** No. 2). In the design of cleaning devices for advanced power generating systems it is necessary to know the effects of extreme temperatures and pressures on the fundamental collection mechanisms involved in gas cleaning processes. By calculating the effects of elevated temperature and pressure on the parameters involved in gas cleaning processes it is predicted the collection efficiencies of all processes will be reduced under these conditions. The most promising mechanism at high temperature and pressure appears to be electrostatic precipitation. (APCA)

**1079. Air Pollution in Petroleum Refining.** Part II. Sutton P. (Chem. Process Eng. Feb. 1968. **49,** No. 2. 96-100). The Alkali Act requires that the best practicable means be applied for preventing the discharge to the air of noxious or offensive gases. Performance and cost data are presented for available equipment for reducing the emission of pollutants. These include cyclones, filters, wet collectors and electrostatic precipitators. The Alkali Act further requires that unavoidable emissions shall be rendered harmless and inoffensive. The principles and costs of high stacks for emission dispersal are discussed briefly. Some of the typical air pollution problems of several industrial operations are reviewed and methods for reducing pollution are described. (APCA)

**1080. Air Pollution and chronic bronchitis.** Lawther P. J. June 1968. (Med. Thorac

(Basel) **24,** No. 1. 44-52). Some of the current studies on air pollution are cited to indicate that air pollution is an important factor in the production of chronic bronchitis. Methods for analyzing the nature and structure of pollutants such as smoke and sulphur dioxide, and for measuring their effects upon the respiratory system are described and discussed. While no specific irritant is implicated, there is a close relationship between the clinical state of bronchitic patients, and the degree and type of air pollution. Other factors, particularly stress and infection, are mentioned. One very sensitive subject, who was given peak flow meter tests five times a day, showed virtually no correlation of results with climate or pollution. In another the highest peak flow rates occurred just after marriage, and again during teething of his child. (APCA)

**1081. Decree on protection against air pollution.** Gtochulski J. (Monitor Polski, June 1967, No. 32. 341-345). The width of protection zones surrounding industrial emission sources in Poland was established. Manufacturing establishments which emit substances causing air pollution are classified—depending on the type of their production—in one of five categories for which the width of the protective zone is as follows: Class I—1,000 m, Class II—500 m, Class III—300 m, Class IV—100 m, and Class V—50 m. The width of the protective zone is measured in terms of a straight line from the source of pollution. The classifications of 280 types of establishments which emit substances and pollute the air are listed according to each category. (APCA)

**1082. A device which measures the density of smoke emissions.** U.S. Department of Health, Education and Welfare, National Center for Air Pollution Control, HEW-T6. Jan. 1968. Photoelectric device for diesel vehicles simulates response of human eye and records density of plumes from tail pipe. (WS)

**1083. Dust collector of exhaust gas by using fire proof glass cloth.** Yasuda Y. (Mar. 1967. Heat Engng. (Tokyo). **193,** 15-18). Control by oil pressure or electricity is preferred to air pressure; a temperature of over 100°C. is preferred at the outlet of the bag house. In order not to destroy the primary screen, "collapse cleaning" is more effective than vibration. The largest quantity of dust was removed when the deflation damper was closed, the inlet damper opened, and the bag restored to its original state. The relation between collapse cleaning and pressure loss is graphed. (WS)

**1084. Reduction of the harmful exhaust emissions of petrol engines by manifold fuel injection.** Schenk R. et al. (in German) MTZ, **28,** 399-402). (Abstr. in MIRA, Mon. Summ. 67/11/30. Nov. 1967). By a rich idling setting, inherent idling stability is ensured, because a drop in idling speed, due to load, will increase the air intake, and the resulting leaner mixture gives higher torque. If, to reduce exhaust emissions, a lean idling/mixture setting is used, mixture-strengthening is necessary for a load increase. Cutting off the fuel when the engine is motored gives two peaks in hydrocarbon emission. One, at cut-off, is caused by residual fuel in the manifold and can be avoided by proper injection timing and fuel-spray shape. The second, generally much higher, peak occurs when fuel delivery recommences but combustion does not start. To reduce this, at low speed, fuel delivery should recommence as close as possible to idle speed. The "cut-in" should be as abrupt as possible. When fuel delivery restarts, the pressure in the manifold should be as high as possible. (WS)

**1085. Economics of Air Pollution (In Czech) Fink K. (Ekonomicka revue, October 1967, No. 10, 472-476).** The probing question posed by the National Academy of Science of the U.S.—what price each country is willing to pay for the cleanliness of its air—is being applied to the problem of air pollution in Czechoslovakia. The cost/benefit test is applied to a highly developed country, but depending on low-grade coals for fuel. In Czechoslovakia, the fight against air pollution must be directed primarily against the disproportions due to the stormy developments of the last 15 years, when insufficient thought was given to the problems of air pollution. As an immediate target consumption of fuel should be cut down in a variety of ways: raising the standards of servicing and maintaining heating appliances, improving the economy of power production by eliminating uneconomical units, minimizing the losses in distribution and consumption of the heat produced, by improving the insulation of buildings, etc. The newly constituted organs under the air-pollution law no. 35/1967 will play an important part in the struggle.

## More Grime in a 'Clean' City than Black Areas

Dr. Catherine Crane, who retired as Medical Officer of Health for York earlier this year, has stated in a consumer group magazine circulating in the city, that levels of atmospheric pollution are frequently higher than in grimy cities which are designated as within black areas. Dr. Crane also states that records from grime deposit gauges in the city show that it compares unfavourably with cities of similar size. Although regarded by visitors as a clean city, the dirt which has eaten into the fabric of the Minster and coated the Theatre Royal during the past 80 years is clear evidence of the harm done by polluted air, Dr. Crane states. Residents often have to wipe soot off their dressing tables and curtains need washing every two weeks.

York City Council has designated its first smokeless zone, which includes the area within the city walls to the east side of the River Ouse. Details of the zone are still being discussed but Dr. Crane estimates that half the houses within it will need to have their grates converted to use smokeless fuel.

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# HARROGATE CONFERENCE

## 22-25 OCTOBER 1968

At this year's Conference an alternative is being offered to those unable to attend as delegates for the full period.

Day membership is available at a fee of £1.10.0 per day with an optional additional charge of £1 for the pre-printed papers.

The Notice and Invitation containing full details will be sent on request. **Early inquiry is urged.**

**The Exhibition** will be held in the Hall adjoining the Royal Hall in which the Conference will take place. A visit is strongly recommended even if attendance at the Conference is not desired.

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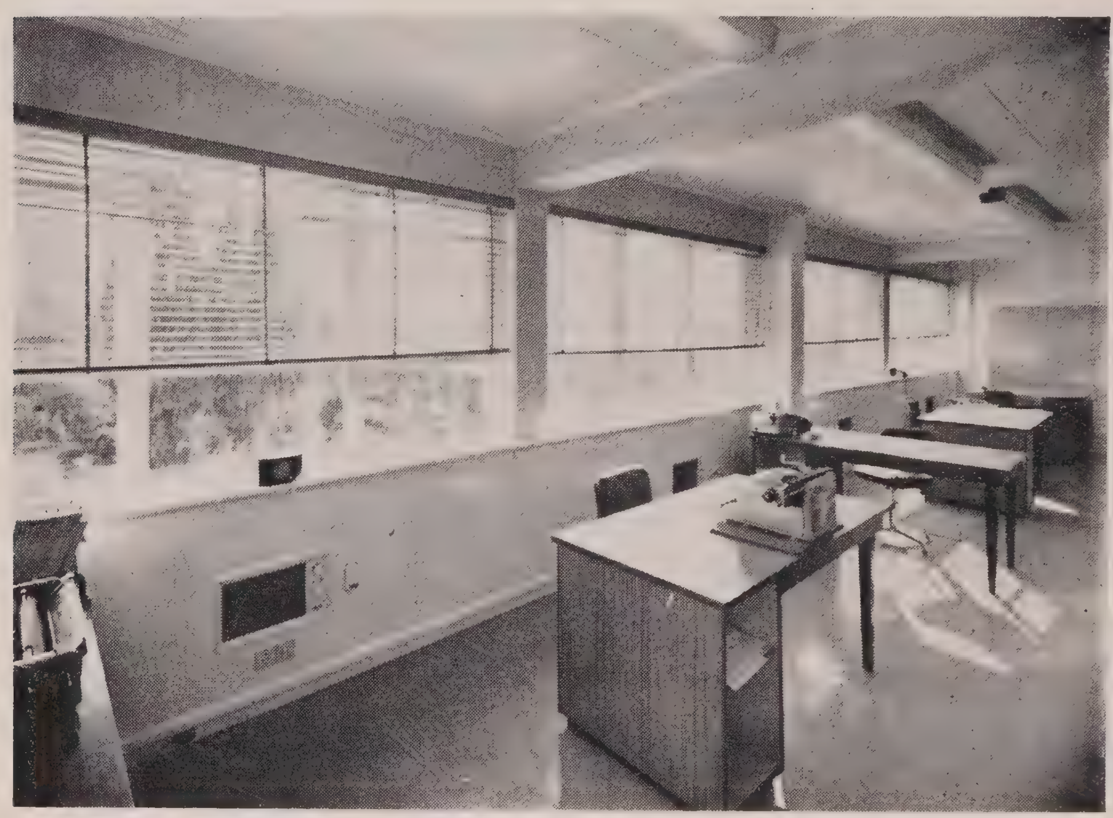

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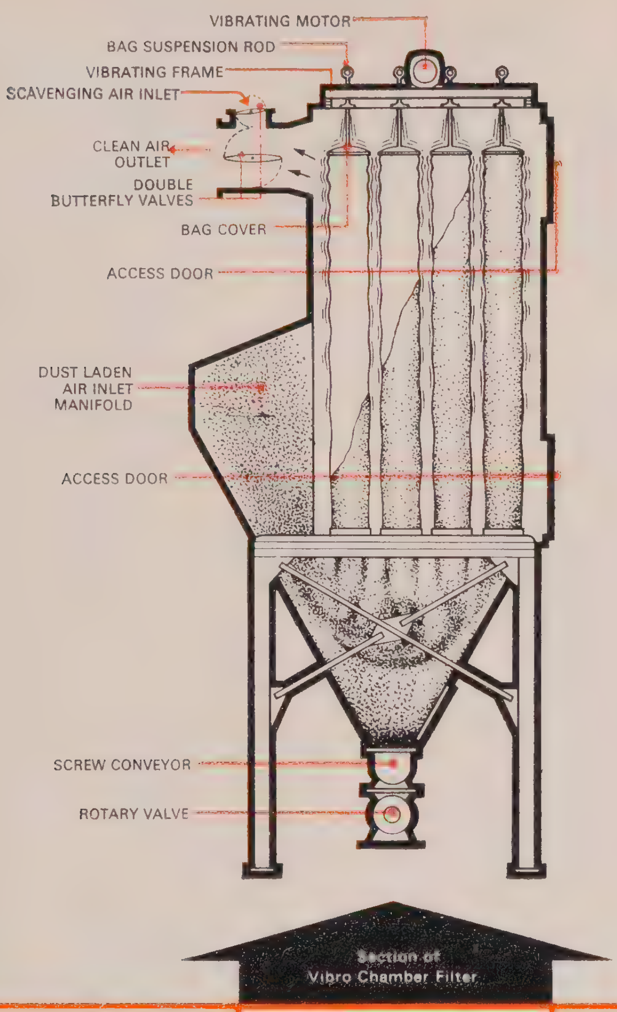
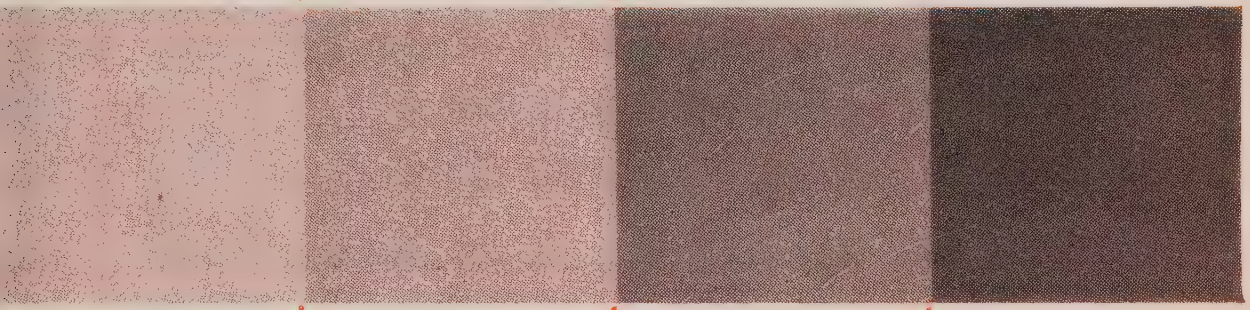


Section of Vibro Chamber Filter

| 99% efficiency – 0·005 microns and above | 99% efficiency – 0·5 microns and above | 99% efficiency – 3 microns and above | 95% efficiency – 10 microns and above |
|---|---|---|---|



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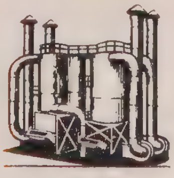
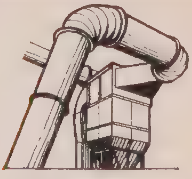


Wet Arrestors



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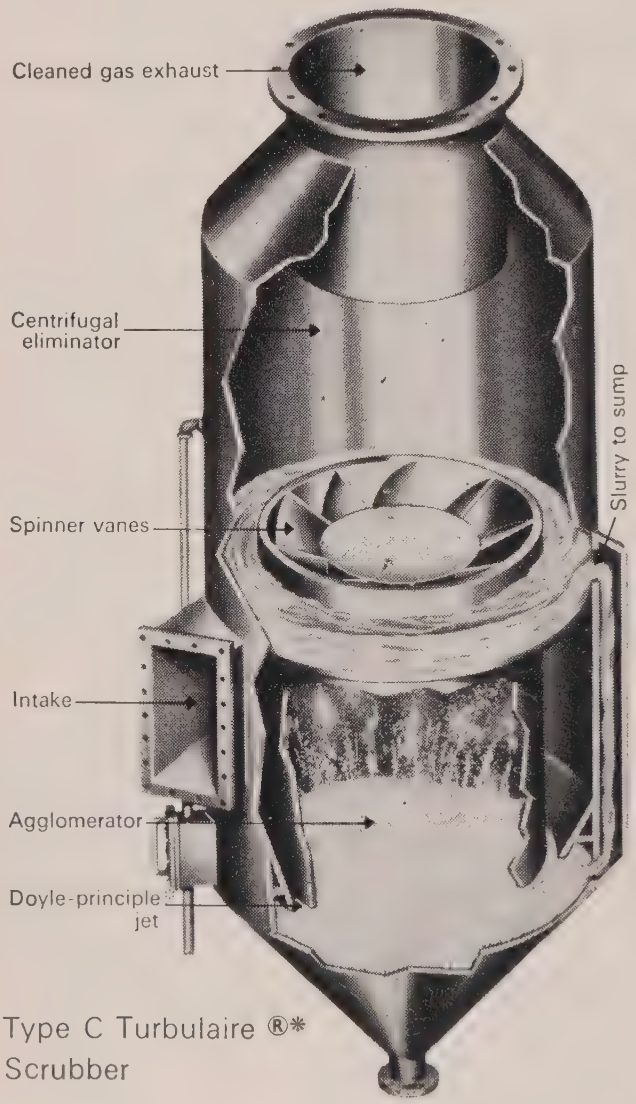

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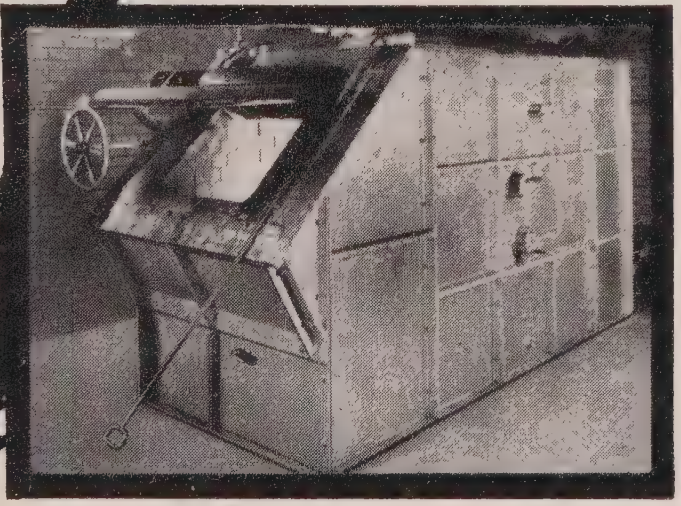

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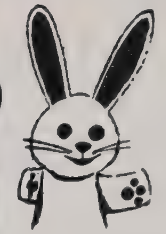

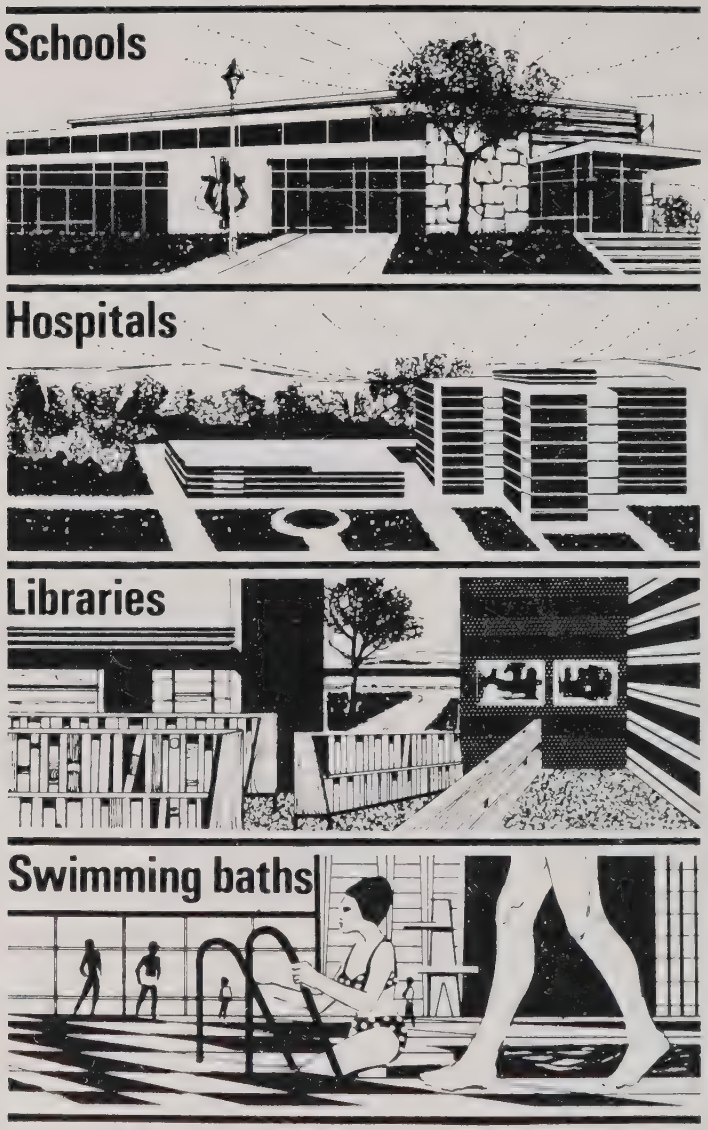

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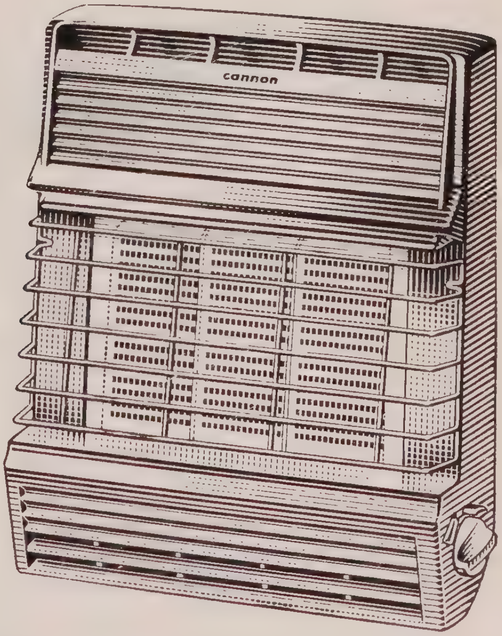

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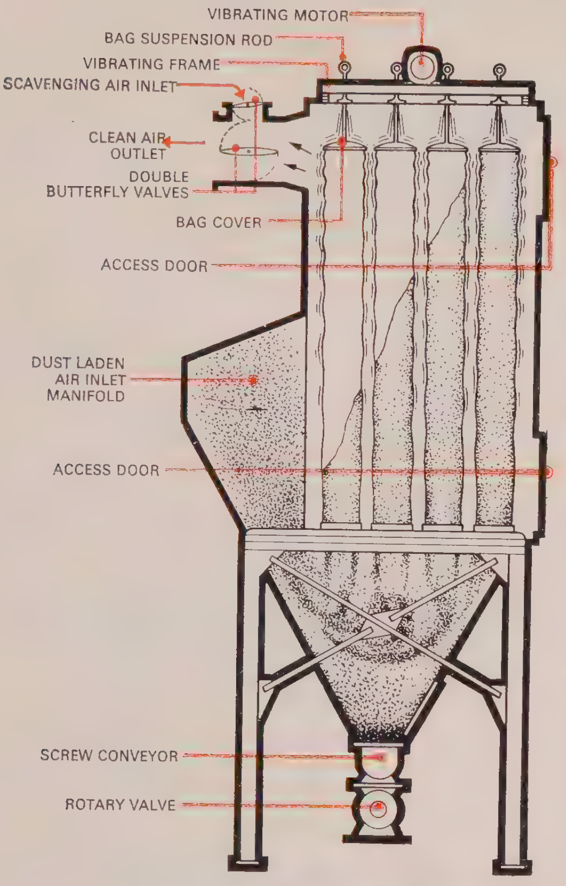

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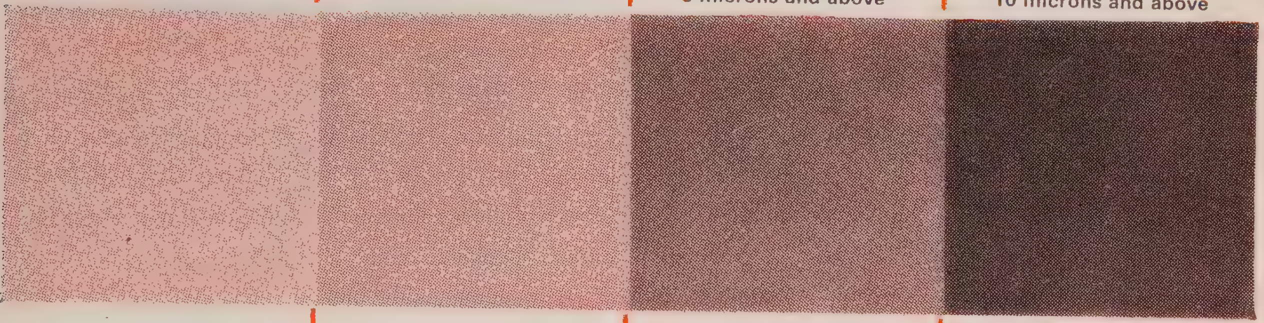

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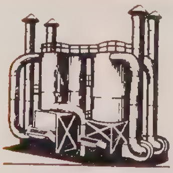

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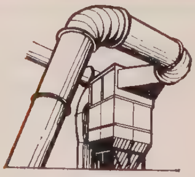

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# SMOKELESS AIR

Vol. XXXIX No. 148 Winter 1968

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SMOKELESS AIR is published quarterly by the National Society for Clean Air at Field House, Breams Buildings, London, E.C.4. Tel.: 01-242 5038 (Editorial and Advertising). Editor: Rear-Admiral P. G. Sharp; Assistant Editors: V. Finlay, A. A. Mister. Issued gratis to Members and Representatives of Members. Subscriptions rate for SMOKELESS AIR only 12s. per annum, post free.
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*Ship, towers, domes, theatres and temples lie*
*Open unto the fields, and to the sky;*
*All bright and glittering in the smokeless air*

# SMOKELESS AIR

## Increased Rates of Subscriptions

At an Extraordinary General Meeting held in the Royal Hall, Harrogate at 9.30 a.m. on Wednesday, 23 October, the Resolution, put to the meeting by the Honorary Treasurer, that subscriptions should be increased to the amounts given in the printed notice of the meeting sent to all members of the Society in August, was carried nem. con.

In moving the Resolution, the Honorary Treasurer, Mr. Stanley E. Cohen, explained that the existing rates of subscription had been in force for some considerable time and that the Society's Executive Council had reluctantly decided that, because of prevalent conditions outside their control, rising costs made it necessary to ask members to approve the new rates which are given below. Mr. Cohen went on to say that last year, despite every possible economy by the staff, there was a loss of £1,321 and the Council, for the second year running, were unable to put aside £1,000 to the premises reserve fund, as had been done in earlier years, thus making a total shortfall of £2,321 for 1967.

Operating costs had risen by an average of 14%. Rates alone had increased 40% over the past four years; amongst other items, paper and printing costs went up by 14% and 6% respectively.

A special appeal by the Director to the Society's major contributors had resulted in an increase in income of £2,000, and "on your behalf I take this opportunity of publicly thanking them, and I feel sure that other members of our Society will wish to play their part", said Mr. Cohen. The financial circumstances of the Society during the last two years had been of constant concern to the Honorary Treasurer and to the Finance Committee, and when it was borne in mind that the lease of the Society's London offices was due to expire in 1970 with a probable increase in rent of at least 60%, Members would realize their anxiety. The proposed new subscription rates showed an average increase of about 20%, and to facilitate accounting with the coming of decimilization, "pounds" instead of "guineas" had been used.

"A Society such as ours must go forward, we cannot stand still. There is still a lot to be done, and to do this we must have the necessary funds. Mr. Chairman, I beg to move the Resolution and hope the motion will receive unanimous approval."

The motion was seconded by Dr. W. C. Turner.

The representative of one local authority member moved an amendment that the rates for local authority members should not be increased, but this was not supported, and on the original motion being put to the meeting, it was carried nem. con.

The new rates, which will come into force on 1 January, 1969 are:

(i) Individual Members—the minimum subscription to be increased from One Guinea to One Pound and Ten Shillings.

(ii) Local Authority Members—future subscriptions for authorities with a population of:

| | |
|---|---|
| less than 25,000 | Eight Pounds |
| 25,001 to 50,000 | Ten Pounds |
| 50,001 to 75,000 | Thirteen Pounds |
| 75,001 to 100,000 | Nineteen Pounds |
| 100,001 to 175,000 | Thirty-two Pounds |
| 175,001 to 250,000 | Thirty-five Pounds |
| 250,001 to 375,000 | Forty Pounds |
| 375,001 to 500,000 | Forty-five Pounds |
| 500,001 and over | Sixty Pounds |

(iii) Corporate Members—the minimum subscription for a corporate member appointing two representatives to be increased from Twenty-five Guineas to Thirty Pounds, and for a corporate member appointing one representative, from Fifteen Guineas to Eighteen Pounds.

## Conference Papers

As expected, opinions about the recent Conference in Harrogate, differed. Generally, comments were favourable; indeed, some went so far as to say that the Conference was most successful. This is, naturally, very gratifying, but what the Conference Committee want to know is whether the Conference is giving *you* what *you* want. One comment was that we were not progressive enough; another was that sessions were not sufficiently technical; while another, large body of opinion, thought that we must be careful not to be too technical. No one can please everybody all the time and it is not easy to get the "mix" of papers right, but great efforts are made to do so.

Divisional Councils have been asked to discuss subjects for next year's and ensuing conferences and to advise the Conference Committee on what they think. But, what do you think? What do you want to hear about and what do you want to discuss? After all, it is your Conference. Please write to the Director of the Society and say what you want at Conferences.

## Arnold Marsh Presentation Fund

This fund has now been closed. In all, £450 has been contributed and sent to Mr. Marsh.

We should like to take this opportunity of expressing our thanks to the Society's Honorary Auditors, Messrs. Geo. Little, Sebire and Co. for administering the fund.

## The Clean Air Act 1968

As forecast in our last issue, Mr. Robert Maxwell's Bill received the Royal Assent at 11 a.m. on 25 October. It has just been announced by the Ministry of Housing and Local Government that Clauses 2, 6 and 8 to 15 inclusive, of the Act will be brought into force on 1 April 1969. It is understood that the remaining Clauses will be enforced later at a date which has not yet been promulgated.

Later in this issue will be found details of the Act and what it entails.

## Smoke Control

We now invariably hear—because it is still, unfortunately, a comparatively rare occurrence—when a local authority completes its Smoke Control Programme. In our last issue we were pleased to be able to report on what has been achieved in Cheadle and Gatley. Now, we are very happy to congratulate Ossett Borough Council on being the first town in the West Riding of Yorkshire to be completely smoke controlled, and Whitefield Urban District Council in Lancashire on completing its Smoke Control Programme.

On the other side of the coin, we hear a good deal about the "laggard" authorities who have not yet made a start in Smoke Control. But what we do not hear about as much as we would like, is the progress made—and sometimes the difficulties encountered and overcome—by authorities in industrial areas with a real struggle on their hands. In our last issue we published an account of what was being done in West Bromwich. This time, we have been glad to receive a report of what is being achieved in Warrington which declares that "the enthusiasm of Warrington residents for smoke control continues unabated—with or without the aid of grant from the Council". This, it is expected, will have the effect of accelerating the programme, which at the present rate of progress, should be completed by 1972. This makes good reading and Warrington is to be commended accordingly.

Why not tell us how your Smoke Control Programme is getting on?

## 1970 International Congress, Washington, D.C., U.S.A.

As arranged at the last Congress in London in 1966, the next International Clean Air Congress will be held at the Sheraton Park Hotel in Washington, D.C., U.S.A., from 6 to 11 December, 1970. The programme is already being planned and the preliminary papers so far received indicate that we, as a Society, are expected to play a full part. The International Executive Committee are due to meet at Paris or Dusseldorf in the Spring of 1969 to start the detailed planning of the Congress. It is intended to publish further information about the Congress as and when it becomes available.

# Harrogate Conference

The Conference in Session

The Society's 35th Annual Conference at Harrogate in October, from all accounts, seems to have been not only very enjoyable, but also extremely successful. The attendance was, in this year of financial restraint, reasonable; in all, 809 delegates attended, of whom 80 were one-day registrations. Many delegates brought their wives with them, and there is no doubt that the ladies played a major part in the success of the social side of the Conference. This year was the first time that facilities for one-day delegates were made available. It is apparent that this scheme was a success; and more than one delegate who originally went to Harrogate for one day only, stayed for longer—and registered accordingly.

The weather was kind. There was fog it is true, and this did make the arrival of Lord Robens at Yeadon a little late; but he reached the President's Luncheon just after it started, and later, took his place on the platform at the appointed time. Local comment was that the fog was "clean"; others had rather different opinions! Perhaps honour would be satisfied if we say that the fog was cleaner than it would have been some years ago—in which case, those who parked their cars in the Crown car park can be glad, judging by the particulate matter collected on car roofs.

The Chairman opens the session on Tuesday afternoon. L. to R. Mr. T. R. Grieve, Lord Robens, the Chairman, and Mr. P. A. Lingard

The Conference got off to a good start on the forenoon of Tuesday, 22 October, with a Civic Welcome from the Mayor, Councillor Alan Mais, J.P., the formal Opening by Sir David Pitblado, Permanent Secretary of the Ministry of Power, whose speech is given in full later in this issue, and the presentation by Sir John Charrington of his second Presidential Address which is also reproduced in this issue.

The programme of papers was sufficiently varied to suit most, if not all tastes, and all sessions of the Conference were well attended. As was to be expected, some sessions were livelier than others, but there was never any lack of speakers ready to take part in the discussion periods.

In his Address, the President pointed out that the response from the Minister of Transport to the resolution passed at last year's Conference had not been very favourable. Partly as a result of this, and partly as a result of the Thursday forenoon session on pollution from road vehicles, the following further resolution was moved and unanimously adopted at the end of the closing session on Friday:

> "That this Conference urges the Minister of Transport to make regulations or introduce legislation to set suitable limits by a reasonable date on the emission of carbon monoxide from petrol-engined vehicles, and to tighten up the regulations controlling the emission of smoke from diesel road vehicles, in order to prevent invasion of the amenities and to implement the developments carried out by the motor industry."

It was unfortunate that because of pressure of other business at the last minute, Mr. Robert Maxwell, M.P., was unable to attend the closing session and open the discussion. Mr. Stanley Cayton, the Chairman of the session, read the following statement:

> "For reasons well known, Mr. Robert Maxwell has, with the greatest of regret, cancelled his participation in the Clean Air Conference, 1968. He asks me to say that the Royal Assent to his Clean Air Bill is due to be given, subject to no unforeseen circumstances arising, at 11 a.m. this morning, Friday, 25 October. He is very glad to have played a small part in bringing this useful Bill to the Statute Book; his whole purpose in doing so was to extend to the whole country the benefits of the 1956 Clean Air Act."

Fortunately, Mr. F. Reynolds, Chief Air Pollution and Noise Abatement Inspector of the City of Birmingham, who has been making a study of the new Bill and its effects, was good enough to step into the breach and open what proved to be an extremely spirited discussion.

The Conference Platform on the Wednesday afternoon

To wind up, a general and very comprehensive vote of thanks was moved by Alderman B. N. Young, O.B.E., of Gateshead-on-Tyne and we then went our several ways. And on leaving Harrogate, your Editor was asked by a well-known local resident if he were now "airtight"!

A party at the very well attended "get-together"

The Conference Dinner—the Mayor replies to the Toast

The social side of the Conference started with a swing at the "informal gathering" on the Monday evening which was unusually well attended and voted by all to have been a very good party, and the pace never slackened throughout our stay in Harrogate. On Tuesday evening there was another big crowd at the very enjoyable Civic Reception and Dance so kindly given by the Mayor and Mayoress; and on Thursday evening over 230 delegates and guests attended the Conference Dinner and Dance, which was most successful and enjoyed by all—so much so that not only were our principal guests, the Mayor and Mayoress of Harrogate among the last to leave after the last dance, but a large party of delegates, guests and staff went on to continue the party, which was going so well, elsewhere in Harrogate until much later. It should be added that they were all seen to be present and correct at the closing session later on the Friday morning.

The Chairman and Mrs. A. C. Saword, and the Mayor and Mayoress, Councillor and Mrs. Alan Mais, receive the guests at the Civic Reception

# The Eleventh Clean Air Exhibition

The Exhibition—a general view

This exhibition, held in the South Hall, Harrogate, proved to be the most successful event yet mounted by the Society, with a very diversified participation from industry. On both inside and outside space, exhibitors staged a magnificent display of highly specialized equipment, which caused great interest from both delegates to the conference and visitors from industry.

In a packed hall, Sir David Pitblado, Permanent Secretary, Ministry of Power officially opened the exhibition, and then accompanied by the Mayor of Harrogate, Councillor Alan Mais, J.P., Sir John Charrington the President, and the Honorary Officers of the Society, he visited all stands where the party were shown the various types of product used in the support of a cleaner atmosphere.

On display were all types of fuels, domestic appliances, industrial boilers, analysing instruments, air cleaning, sampling, dust and recovery equipment, industrial fans, incinerators and chimneys, along with many other allied products. A spectacular outside demonstration of the practical working application of incineration gave visitors first hand experience of the modern machinery now being manufactured to handle the problems of waste disposal.

The Exhibition—Sir David Pitblado with the President, Chairman, the Mayor of Harrogate and the Director

The Exhibition—another view

The Exhibition—Lord Robens at the Allied Ironfounders Stand

Amongst many notable visitors to the exhibition, it was a great pleasure to welcome Lord Robens, Chairman of the National Coal Board, on Tuesday afternoon. After discussing various stands he spent a considerable amount of time discussing the future of the exhibition and the continued support of the solid fuel industry.

With the future based on an extremely satisfactory event, it is hoped that the 1969 Clean Air Exhibition at Eastbourne will be even more successful.

## Conference Publicity

Taking into account the fact that this year nothing particularly controversial has been discussed in Harrogate, the publicity accorded to the Conference both on the air and in the press, has been very satisfactory indeed. The "story" which undoubtedly attracted most attention all round, was the announcement by Mr. P. A. Lingard about the proposed electric mini buses. This was well timed by the Electricity Council as an additional news story to Mr. Lingard's paper on the first day of the Conference. The three-page clean air survey which appeared as a supplement in the Financial Times on 22 October, was also a very valuable source of publicity for the Conference and exhibition.

## TV and Radio

On the opening day of the Conference there were three television programmes (one of them over 13 minutes) and four radio programmes about various aspects of clean air. In addition the Director was interviewed for the B.B.C. overseas service on air pollution legislation in this country, and the Central Office of Information recorded Dr. A. Parker for a transmission to America. On the second day there were two radio programmes; on the third, one T.V. and one radio, and one T.V. programme on the final day. Details of programmes as follows.

**22 October, 1968**

| Service | Programme | Content | Mins. |
|---|---|---|---|
| Radio 4 | "News of the North" 8.10 a.m. | 1,000 delegates gather in Harrogate for the four-day conference of the National Society for Clean Air.—James Hogg reports on agenda. | 1′ |
| Radio 4 | "World at One" | President of the Clean Air Society quoted on the progress being made in smoke control.—Falling below expectations | 30″ |
| BBC T.V. | "South Today" 6 p.m. | Call made for the use of electric buses in city centres. | 30″ |
| Radio 4 | "Radio Newsreel" 6 p.m. | Interview with Mr. Lingard of the Electricity Council, about his speech at the Clean Air conference, calling for electric public transport in city centres.—Advantages would be lack of air pollution and noise. | 2′ |
| BBC T.V. | "Look North Leeds" 6 p.m. | Air pollution.—An international problem.—Interview Dr. Albert Parker of Royal Society of Health, re the threat to the world of air pollution.—Also comments on the problem of river and sea pollution. | 4′ 30″ |
| BBC T.V. | "Look North Leeds" 6 p.m. | Details of pollution statistics. Interview Lord Robens for views on clean air legislation.—Wholly in favour of Clean Air Act.—Explains efforts in converting appliances for burning smokeless coal.—Gives support for the ideas of district heating. | 6′ 30″ |

| | | | |
|---|---|---|---|
| Radio 4 | "Listening Post"<br>10.30 p.m. | Listeners' letter concerning the positioning of exhaust pipes on cars.—Call for a law to control this. | 1′ 30″ |

**23 October, 1968**

| | | | |
|---|---|---|---|
| Radio 4 | "Today"<br>7.15 a.m. | Interview by Dr. Albert Parker of the Royal Society of Health.—Comments on Britain's lead in the matter and efforts being made in other countries. | 2′ 30″ |
| Radio Sheffield | "Edition One"<br>8.10 a.m. | Dr. Albert Parker of the Royal Society of Health, interviewed about the problem of air pollution. Britain is the only country with nation-wide legislation to control it. Believes there will be no smoke pollution left in Britain by the year 2000. | 2′ 30″ |

**24 October, 1968**

| | | | |
|---|---|---|---|
| Radio 4 | "Voice of the North"<br>6.25 p.m. | I.C.I. expects to spend £20 million to combat industrial pollution.—Plan announced during visit to company's Wilton works by fifty members of the Clean Air Society. | 30″ |

The Exhibition—The Mayor of Harrogate, Dr. W. C. Turner, Sir David Pitblado and Mr. Stanley Cohen show great interest in an exhibit

| | | | |
|---|---|---|---|
| Yorkshire T.V. | "Yorkshire Calendar" 6.45 p.m. | I.C.I. plan to spend £80 million on pollution control in the next ten years.—Most of it on Teeside. | 20″ |

**25 October, 1968**

| | | | |
|---|---|---|---|
| BBC T.V. | "Look North Newcastle" 6 p.m. | Air pollution.—I.C.I. to spend £80 million to try and combat it. Clean Air Society members interviewed about importance of local authority and industrial co-operation. | 3′ 45″ |

The Exhibition—the platform party view an incinerator burning old motor tyres, smokelessly

## Press Publicity

As usual, press stories on the Conference and exhibition were sent in advance to the national, local and technical press, with a separate release on each of the Conference sessions. Up to 7 November, 315 press cuttings on the subject have been received from every kind of publication and many more are expected. This total so far, exceeds the number of reports received after last year's Conference.

On the opening day of the Conference, 25 journalists were entertained to luncheon at the Crown Hotel, Harrogate. Members of the Conference Committee acted as hosts at this pleasant function.

# The Technical Visits

The 1968 technical visits to Eggborough Power Station, Tinsley Park Rolling Mills, The City of Leeds and the I.C.I. Works, Wilton, were very popular with delegates and when the coaches left the Royal Hall on Thursday, 24 October, there were few vacant seats. Those taking part in the visits represented varying spheres of clean air interest and came from many parts of the world, including a number of technicians from Czechoslovakia. We are grateful to those who led these visits for the following information.

## Eggborough Power Station

On arrival at the Power Station the 34 delegates were warmly welcomed by Mr. Cooper, the Station Superintendent, who explained the details of the operation of the station, its maintenance, administration and construction. He went on to tell the visitors that they were fortunate in that they could inspect a power station actually under construction and would be able to see generating equipment fully operational and another on the point of commencing power generation.

Delegates formed into groups and were taken to the arrival point of the coal used in power generation. The method of conveyance to the pulverizing machines, consumption and subsequent disposal of the many thousands of tons of ash, the cooling towers, and the many processes involved in power generation were seen. A well-instrumented atmospheric pollution unit situated in the grounds of the station was also inspected. The solitary stack, one of the largest in the country, turned out to be a tower containing four chimneys and possessed a lift running up the centre to allow for the required maintenance of aircraft warning lights, etc. Delegates were told that the space at the top between the chimneys could house a full-size tennis court.

To the uninitiated, the station control room looked like a scene from a science fiction film and was so complex that it was quite impossible to grasp its many functions in the time allotted. Thanks are due to the Central Electricity Generating Board for offering the visit and for providing such generous hospitality; to Mr. Cooper, the Station Superintendent; and especially the engineer guides who answered with patience and skill the many questions put to them.

*E. A. Taylor*

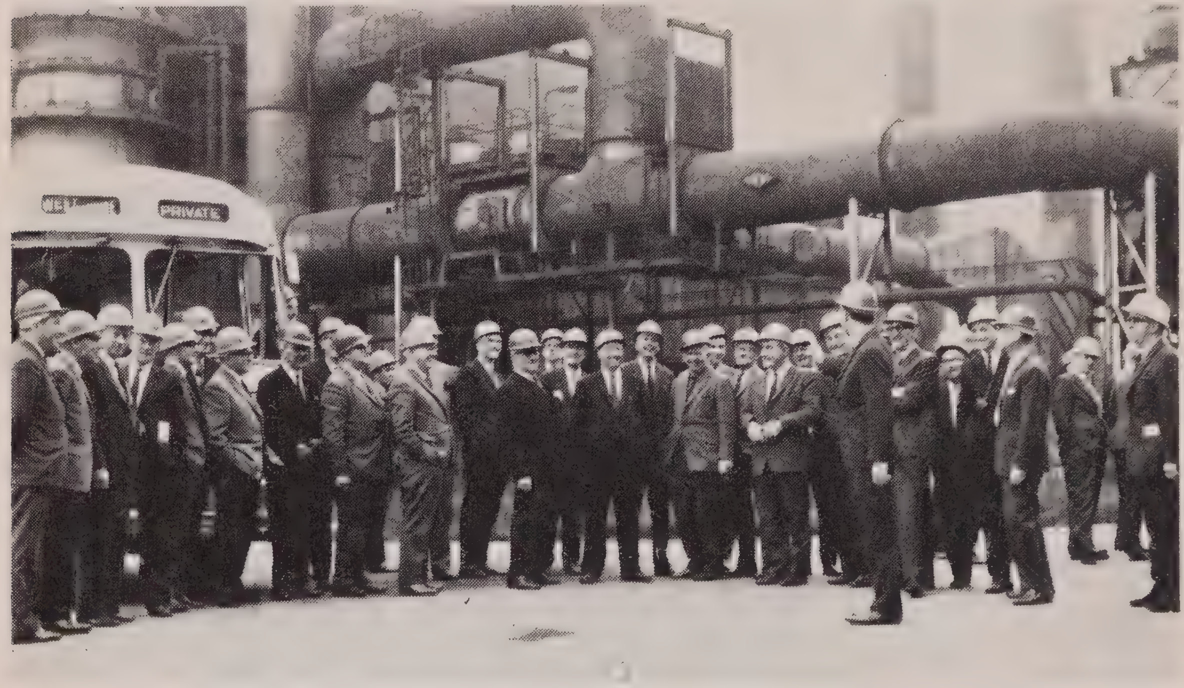
## Tinsley Park Rolling Mills

The visit to Tinsley Park, Sheffield, provided an opportunity for 40 delegates to see steel being made by the most up-to-date methods employing electric arc furnaces and vast areas of rolling mills. The party was met on arrival at the Steel Works by Mr. Philips, the Manager, who introduced the engineer guides who were to explain the various processes of manufacture, grit and fume arrestment, and the handling of billets and rolling. Subsequently they had the additional duty of answering innumerable questions.

Tea was served in the Works Canteen at the conclusion of the visit and Mr. Philips recapitulated the various aspects of steel manufacture and showed how the processes employed had been developed with clean air in mind.

Mr. W. L. Kay of the Society's Executive Council, expressed cordial thanks to Mr. Philips and all those within the English Steel Corporation who had helped to make the visit possible.

*G. W. Dhenin*



The Party at the Tinsley Park Rolling Mills

## City of Leeds

Three coach loads of delegates to the Conference opted to visit Leeds and were met at the City Boundary by Supervisory Public Health Inspectors, Messrs. Wheatley, Huggins and Lee, and taken on a conducted tour of the City. Modern light industrial development having boiler plants which conform to the requirements of the Clean Air Act and where plans were submitted for prior approval were seen on the Ring Road.

The party continued to the Whinmoor Municipal Estate which was constructed to be smokeless from its inception. This estate together with the adjoining Seacroft Estate will eventually have a population of approximately 50,000. A special feature is a pedestrian way running through the whole estate and having links to shopping centres and children's play areas. The "way" is landscaped with rockeries, trees and lawns combining to give a pleasing effect on a safe and traffic-free way. The party then passed through Seacroft Village which contains many houses without modern amenities. Many of these houses are so badly dilapidated that upgrading is not feasible and 86 of them have been represented as unfit. The old village is now surrounded by modern development. The party visited Seacroft Town Centre, a municipal development, which has generous underground car parking facilities and includes a Health Centre, a library, a youth centre, a Welfare Services hostel and also shops, open-air market, hotels and the like.

The delegates appeared to be impressed with the scope of improvement grant area procedure in Leeds in particular the many streets of back-to-back houses which present a pleasing appearance. The delegates saw slum clearance areas some of which were zoned for light industrial development including the new studio of Yorkshire Television. They were taken on the first stage of the Leeds Inner Ring Road and could see the second stage under construction. Having seen a municipal centre development they then passed through the Merrion Centre which is a private development.

All this journeying necessitated some refreshment and the party was welcomed at the Civic Hall by Alderman Mrs. Henson representing the Chairman of the Health Committee.

The delegates were then taken through the Studley Grange area which includes some 2,000 houses many of which are large Victorian properties, rapidly deteriorating and being let off in multiple occupation. Many of these have been acquired compulsorily by the city and converted into self-contained flats and maisonettes or, where owners were agreeable, improvement grants have been given. The area is being landscaped, garage sites and play areas for children being provided. The party then proceeded through Roundhay Park, the second largest park in Leeds containing 615 acres and many commented on the large number of parks and open spaces provided for the enjoyment of the citizens of Leeds. The journey took some three hours and the delegates were wished a safe return at the City Boundary.

## I.C.I. Heavy Organic Chemicals Division, Wilton

The party visiting the I.C.I. Works at Wilton were welcomed by Dr. H. E. North, Management and Commercial Services Director and Chairman of the I.C.I. Effluent Committee. He told the delegates that in the last 15 years his Division and its predecessors had spent well over £2 million on capital equipment to eliminate atmospheric pollution from its plants at Wilton, Billingham and North Tees. In the same period, an additional £300,000 had been spent on research to devise ways and means of making plant as clean as possible and designing equipment to put them into effect. The maintenance and operation of this pollution prevention equipment on the Division's plant alone was running at around a quarter of a million pounds a year. Dr. North went on to say that they were investigating the possibility of establishing a series of monitoring stations to serve the whole of Wilton, consisting of mobile laboratories and fixed sample stations, at a capital cost of about £13,000. Operating costs would be over £20,000 a year. The stations would measure noise levels as well as taking atmospheric samples.

In the 10 years ending June 1964, the Division had spent over £1½ million to reduce the amount of smoke, fumes and smell, said Dr. North, and all this vast expenditure shows no sign of diminishing, in fact, as plants become bigger and more sophisticated and with the requirements of legislation becoming more and more stringent, the indications are that the cost will increase in the future.

The delegates in the party were joined by members of Teeside Public Health Committee and toured the installation and plant with special emphasis on the steam-raising equipment. Mr. S. Cayton, the leader of the party, expressed thanks to Dr. North for the hospitality enjoyed and the comprehensive nature of the visit.

Mr. S. Cayton with Dr. North and Mr. G. Lofthouse at the I.C.I. Works at Wilton

## Ladies' Visits

The following details of visits enjoyed by delegates' ladies during the Conference have been sent by the leaders of the two parties to Rowntree's, York, and Bolton Abbey and Haworth. We are grateful to them for their help on this occasion and for sending so much interesting detail.

A visit to Rowntrees of York was arranged for ladies and this proved both interesting and enjoyable. After assembling in a hall where showcases illustrated the growth of the factory over the years and the world-wide distribution of the products, the visitors were taken round the works by charming and knowledgeable guides. The scale of the enterprise can be judged from the fact that there are now over 8,000 employees and the factory has its own fire station and brigade which is called on in emergency by the City of York.

To see the making of so many popular chocolates and sweets from start to finish was most fascinating. After the tour of nearly two hours a welcome tea was served in the pleasant staff canteen and the management also generously presented each visitor with a gift box. There were warm expressions of appreciation to the guides and management for their help and hospitality.

*G. Christine Courtier*

The ladies' visit to Wharfedale, Bolton Friary and the Brontë Museum at Haworth, was a day to remember. In summerlike sunshine Wharfedale looked its most beautiful, and its present loveliness was enhanced by the delightful glimpses of the past as the coach driver peopled the scenes for us with graphic descriptions of Prince Rupert's battles amid the cornfields of old; we could visualize Commonwealth troops advancing over the hills; appreciate the charities of the Lady Anne Clifford as we passed the picturesque alms houses; the advantages, visual and practical, of the coming of the reservoirs.

At Bolton Friary we were fortunate to meet the local vicar who kindly explained that the foundation was a Friary and not an Abbey. He told us something of its history and its connection with the nursery rhyme "Hey Diddle, Diddle".

Then to the Brontë home, a dour, but fascinating place to all Brontë admirers. How small in stature they must have been to wear the clothes on display! But how great in literary ability.

An added joy was the visit to Emmott Hall—which is mentioned in "Jane Eyre"—and is now in process of being restored to its original 14th and 16th century charm, by the host and hostess who served us with tea.

*Ruth Bourne*

A new feature of the Ladies' Programme at Harrogate was a most interesting talk on "Choosing Antiques for the Modern Home", by a local antiques expert, Mr. Robert Aagaard, who specializes in fine furniture. It was a pity that the attendance was poor because this was a most enjoyable and instructive talk.

Mr. Aagaard went to a great deal of trouble to provide us all with drawings of the typical domestic furniture from the 16th to the early 19th century, showing the kind of pieces which fit into present-day houses. We were advised about the best pieces to buy and the chief points to look out for in the various periods, and how to spot the more obvious fakes: and there were very useful hints on the care and polishing of old furniture. Many questions followed and Mr. Aagaard spent a long time answering them all very lucidly, before we all adjourned for tea.

*Dilys Sharp*

## The Golf Tournament

The golf competition for the Solid Smokeless Fuels Federation Cup has now become an established part of the Conference programme, and an inclusion much looked forward to by those seeking a little relaxation from the work of Conference.

This year the event was staged at the Pannal Golf Club, Harrogate and attracted a record entry of thirty-three players.

The Pannal course is set on the hillside to the south of the town, many of the holes being played on the high ground above the ridge. These not only present a tough test of golfing ability but provide a magnificent viewing ground for the beauty surrounding Harrogate, including a breath-taking sight of the long Wharfe valley leading to the not too distant Pennine hills.

Although winter work is well in hand at Pannal—and Pannal is always moving forward—the course was in excellent condition for winter golf, whilst the clerk of the weather excelled himself and provided a warm afternoon, no rain and some pleasant sunshine.

The "Tigers" forecasted low scoring and proved to be really accurate. Playing a "Stableford" single, only three players managed to equal or better their handicaps and the ultimate winner proved to be Mr. B. R. Nagle with a score of thirty-nine points; it was a neck and neck finish with Mr. D. Walker returning thirty-eight points and Mr. H. F. Robinson thirty-seven.

This was the second time in three years that Mr. Nagle has scooped the trophy and it was with obvious pleasure that he received it with its replica and prize from His Worship The Mayor of Harrogate at the end of the Conference dinner.

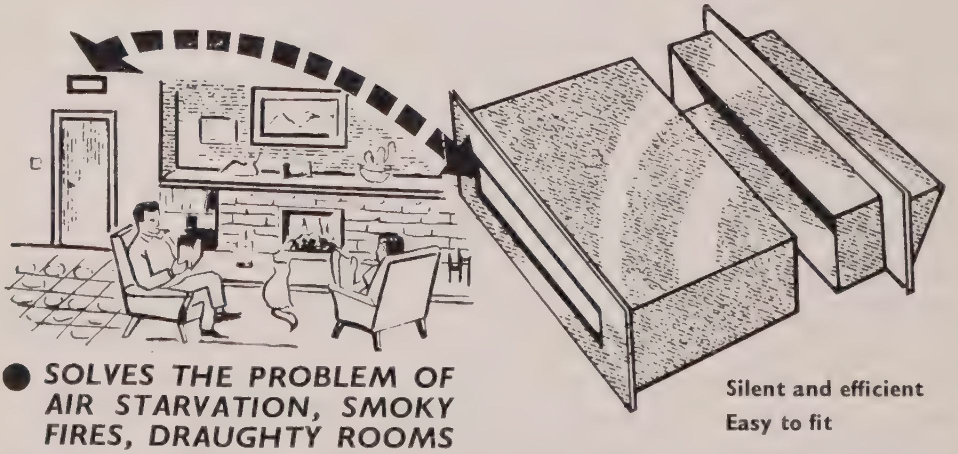
Conference moves next year to Eastbourne where, without question, there will be many waiting to deprive Mr. Nagle of the Cup, and at the same time enjoy a pleasant game, a friendly chat and a relaxing afternoon.

*E. J. Winfield*

## Training Courses in Measurement of Grit and Dust

Where local authorities or others desire to make grit and dust measurement themselves, N.I.F.E.S. announce that they can provide a one-week training course, provided a minimum of six trainees can be formed as a group. The course covers demonstrations of equipment approved under the Clean Air Act and practical instruction, including participation in an actual test. Graphs and notes, which will be of future help to trainees, are provided.

B.C.U.R.A. also announce that they are prepared to run two-day courses on their method of testing at a cost, exclusive of meals and accommodation, of £25 per head based on 16 people per course. These courses are intended for those who will be closely connected with dust sampling and who already have some experience in taking readings with simple scientific tools such as balances, manometers and normal indicating devices. Enquiries for such courses should be addressed to Mr. J. S. Hales, O.B.E., Deputy Director General, B.C.U.R.A., Leatherhead, Surrey.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# Opening Address

by

## Sir David Pitblado, K.C.B., C.V.O.

*Permanent Secretary, The Ministry of Power*

As a background for your discussions I would like to make some general points about the part the Government plays in fuel policy.

Government actions affecting fuel policy take many forms: for instance investment decisions; financial arrangements; decisions on taxation. But Fuel Policy has been presented fully and coherently in two White Papers, the latest issued soon after your Conference last year, (Command 3438) in continuation of the earlier White Paper of October, 1965 (Command 2798). Fuel policy is a developing and not a static matter, and there will be further Government statements and White Papers in due course. For instance, the implications of devaluation were dealt with by our then Minister, Mr. Richard Marsh, in the House of Commons last January.

There is no difficulty over defining the broad objectives of fuel policy. But the

Sir David Pitblado opens the Conference

objectives are to some extent conflicting. There is naturally difficulty in working them out in practical terms, and room for differences of view on the desirable courses to follow.

The first objective of fuel policy is both obvious and fundamental. Fuel is a basic essential of all our households and all our industries, and the Government must watch over security and adequacy of supplies. We now have two new primary fuels: natural gas and fissionable material. These strengthen our position in the longer-term. In the medium-term it can safely be said that our fuel industries are well able to meet the expanding demands both of the domestic consumer and of industry.

At this time of the year the industries are naturally also looking to the short-term, the coming winter. In general they are in a better position to cope with winter conditions and demand than they have been for many years, though it would be foolish to be complacent about possible local or special difficulties in supply.

The second objective is that our fuel should be supplied as cheaply as possible. This is also obvious: but more complex.

The first factor is that we have four separate fuel industries. There are sectors of demand where one industry has a dominant position, like oil in road transport and electricity in lighting. But they compete over a very wide field, in which both industrial and private consumers have freedom of choice. There is no doubt that this is a great stimulus to each fuel industry to provide what the customer needs with the best possible service and at the lowest cost.

But what is the lowest cost? There is a great deal of weight in its simple meaning, the cost to the consumer. A country that has to live by exporting cannot afford to have high fuel costs particularly in relation to those of its competitors: the provision of cheap and abundant fuel and power to the home is a major social good. The consumer is rightly guided in his choice of fuel on its suitability for his needs, and in particular on what he has to pay now and expects to pay in the future. As I have said just, competition between the industries is a potent force in keeping their costs down.

But, in the broader national interest it is necessary also to keep the overall cost of providing our fuel and power as low as possible; that is to say that it should use the minimum national resources. This result will not be achieved if each industry simply pursues its own objectives.

To secure the national interest the Government must establish the framework in which these four competing industries work. It does so, of course, through its general economic and fiscal policies, but it must also look at the fuel sector as a whole. It must try to ensure that the national considerations that ought to weight the pattern of fuel supply and demand are reflected in it, without taking away from the consumer his right of free choice or from the fuel industries their incentives for innovation and vigorous development and for the provision of high standards of service.

It is therefore important that pricing policies should be properly related to costs and investment properly related to both. The Government reviewed the principles which the nationalized industries follow in reaching decisions about prices and investment in another important White Paper, also published last November (Command 3437), and the Select Committee on Nationalized Industries has given this their support.

The balance of payment costs to the economy have also to be weighed.

Here again there is truth in the commonsense view that the cost to the consumer is an important guide to the national interest. Where goods can be produced better and more economically overseas, we are better off if we can pay for imports by exporting goods for which we ourselves have special skills: this is particularly true for raw materials and fuel on which we are dependent for the production of our more sophisticated manufactures.

Nevertheless, we must not forget that until recent years we had ample supplies of indigenous cheap fuel, and indeed were net exporters of energy. Our fuel balance of payments has changed much for the worse in the past 30 years, owing to the rapid expansion of oil imports into the British market and into markets abroad which used to take British coal.

More than half our imports of oil are for uses, particularly transport, and in many chemical industries, for which there are at present no effective rivals, or where oil gives special advantages. Moreover, the balance of payments cost of oil to this country is kept down by the investment and skills of British oil companies.

Even so, each extra ton of oil that we import has to be paid for by additional exports and services. Therefore we must so set the competitive framework that we make the maximum economic use of our own resources.

We are fortunate in that natural gas has a balance of payments cost only in respect of the foreign risk capital and expert knowledge equipment which has taken part in its discovery, and that the balance of payments cost of nuclear energy are also low. But we must continue to make a maximum economic use of our indigenous resources of coal.

This is not the occasion to go into all the complex factors which must enter into the judgement of what is the maximum economic use of coal. Technological changes, for instance in transport and gasmaking have reduced its markets, and its level of costs are a major factor in other competitive fields. To reduce them and to hold as many markets as possible, the coal industry is consolidating on its better pits and making rapid improvements in productivity. We can all pay tribute to what the industry is doing and the responsible attitude of the miners and their leaders.

The Government is helping by policies of continued protection and additional support for coal in order to prevent it from running down damagingly fast during the period of consolidation.

I emphasize that the White Paper policies are policies in massive support of coal, by protection, and from the taxpayer, since many here who have no time to keep in close touch with these issues might be pardoned for getting an opposite impression from some things they read.

I will recall briefly what is being done to help coal. It receives a high level of protection; imports of coal are prohibited, and the tax on fuel oil represents a big loading on its pretax price—of some 35% for large industrial users. It receives a high level of Exchequer support. The major capital reconstruction in 1965 transferred a big element in its financial costs to the general taxpayer. By the further Coal Act last autumn, its markets in electricity and to some extent gas, are being helped for the four years until March 1971, by Exchequer finance for a substantial extra coal-burn. Thirdly, both Acts give the industry and its workers major assistance in the practical and social problems of pit closures while the Government's regional policies are designed to stimulate more rapid growth in many of the areas affected.

The policy decisions in the White Paper were based on a very thorough examination in the Government and with the industries, of the likely trends of fuel use. This forecasting was not once for all. It is a continuing process. All the fuel industries are making use of the rapid developments in techniques of forecasting. So are we in the Ministry of power, where we have a strong Statistical Division. Many will be familiar with the analyses consolidated in our Annual Statistical Digest. But forecasting is based not only on the recent past but on the latest trends and changes in costs and techniques that can be foreseen.

We are also developing a system of mathematical models of the energy sector, so that computer techniques can be used to work out, in terms of quantities and prices, the interaction of a wide range of different possible policies. This is pioneer work and there is a long way to go, but it promises better tools for decision making than have been available in the past.

Logically, I should have discussed this forecasting work before discussing policy decisions. But while the White Paper figures, or rather ranges of figures, were the best that could be worked out, I did not want to give them too much emphasis. The intention was to give the public the background information for policy. This has led to some misunderstandings. Figures are read without the qualifications which are so important. There are indeed qualifications set out in the White Paper with which the Table reproduced at page 15 of the Report need to be read. But it is surely right that this data should be made public. We and the industries can all learn from comment and criticism and informed debates.

The figures are sometimes treated as if they were targets. But they are not targets. They illustrate trends and present policies, but do not constrict the future course of events. They are not a programme in the same sense as, for instance, we try to plan the best use of limited financial resources in our private or national life, or in the same sense as the environmental planning with which many here are so closely concerned.

Any industry, private or public, must know where it is trying to go, it must assess the development of technology in its own and rival industries, forecast the environment in which it will be living, and make the necessary investments in time to achieve its objectives. In time, but not too soon, as each decision becomes necessary, all the relevant factors are reviewed on the latest information.

This is true both in the fuel industries and in the framework of Government policies in which they work. Some investment decisions, such as for our huge power stations, hit the headlines. The time scale of construction is such that decisions have to be taken on the best judgement now of conditions in the mid-seventies. The gas industry's broad plans for developing North Sea gas also have to be long term. But the bulk of investment decisions in the industries have a shorter time scale.

To sum up: if we are to use all four primary fuels to the best advantage, fuel policies must be worked out as flexibly as possible, and the White Paper continually stresses the need for adjustment as circumstances change. But its main themes are clear: the rapid introduction of North Sea gas: the continued development of our growing skills in nuclear power: and continued and increased support for coal.

I have not said much about clean air policy. The new developments with natural gas and nuclear energy are obviously helpful. And all four primary fuels can be used and secondary fuels can be supplied in forms which meet clean air requirements. Thus there is no need for a special link between the fuel policies I have discussed and clean air policies. Clean Air is rather a basic social objective which the fuel industries, like other industries and the public as a whole, must further in the national interest. To do so, clean air regulations restrict individual freedom of action: there has to be background of compulsion not only to give anudge to the reluctant, but also to justify the industries in incurring costs in providing fuels in the right form.

I need not, however, tell this audience that the fuel industries do not adopt a grudging or negative attitude.

They play a notable part in the work of the Association and are among the leaders of public opinion. The important papers which we are going to hear this afternoon from four top leaders—illustrate the responsible attitude of the industries and the ingenuity and expenditure they devote to research and development to further these ends.

Finally, a brief word about the part the Ministry of Power plays in these matters, which are mainly within the responsibility of each of the industries and, within the Government, of other Ministries. Our contribution, though modest, is not passive or negative. Our Parliamentary Secretary is one of the Vice-Presidents of the Clean Air Council. Three members of the Ministry are taking part in this Conference.

As the 1965 White Paper brought out, we watch the supply position of the various fuels needed to maintain progress in Clean Air policies. Our scientific staff keep in close touch with technological advance. And we play our part in the development of legislation, including Mr. Maxwell's Bill which is now awaiting Royal Assent.

Mr. Maxwell's Bill, about which the Conference will later hear from its sponsor, is a fitting note on which to end this introduction; it is happy evidence of the influence of your Society and of private initiative and of Government support in furthering clean air objectives. Mr. President, it only remains for me formally to declare the Conference open.

## Sir Oliver Graham Sutton honoured by the Air Pollution Control Association

Sir Oliver Graham Sutton of London was the recent recipient of the Frank A. Chambers Award presented by the Air Pollution Control Association for outstanding achievement in the science and art of air pollution control.

The Chambers Award was established in 1954 to commemorate the founder of the Smoke Prevention Association of America, the forerunner of the Air Pollution Control Association, and the award has been made to Sir Oliver for his work in the field of micrometeorology.

# Presidential Address

by

Sir John Charrington

It is not easy in an address of this sort, especially when one looks at the papers which are to be presented at the sessions which follow, to avoid impinging on what other speakers might say. As you will see, the range to be covered in the next few days is wide and varied. So I hope that I may be forgiven if I do touch on a number of points which will be raised later.

During the summer we have all been interested in watching the progress of Mr. Robert Maxwell's new Clean Air Bill. At times there has been apprehension that the Bill would be delayed and might not be completed in the current session. However, these fears have now been allayed and all is well. Now, I do not intend to review all the important new provisions which the Clean Air Act makes—especially when I have no doubt that full justice will be done to this subject in the session on Friday morning at which Mr. Robert Maxwell himself will open the discussion.

But there are two points in which I am particularly interested and to which I would like to refer.

The first is the fact that under the new Act the Minister of Housing and Local Government can bring pressure to bear on those laggard local authorities in the black areas who are not getting on with their smoke control programme fast enough. I think it would be true to say that generally the progress made in smoke control is not so fast as any of us would like. It is certainly encouraging that some local authorities have completed their smoke control programmes already. But these are few and far between and progress is certainly nothing like as fast as was envisaged by the Beaver Committee. Indeed, that Committee envisaged that early in the 1970's most of the so-called black areas would be largely smoke controlled. But under present progress we know that it is going to be well into the late 1980's before this is achieved. Anything, therefore, which can bring pressure to bear on any local authority to step up its smoke control programme is very welcome.

The other point which is of interest to me with my own personal background is the fact that the regulations regarding the selling of bituminous coal in smoke control areas have been very much tightened up. It is to be hoped that this new regulation will effectively plug what was a loophole in the old regulations.

On Thursday morning we are to have a session dealing with the ever-increasing problem of pollution from road vehicles. I am particularly glad to see that we are to have a paper from Mr. Fosberry, the Assistant Director of the Motor Industries Research Association, and I hope that in that session we shall really be able to find out what the motor industry is doing to combat this problem.

You will recall that at our Conference last year a resolution was moved drawing the attention of the Minister of Transport to the Society's Report on air pollution from road vehicles, and informing the Minister that it was now technically feasible to reduce the emissions of carbon monoxide from petrol-engined vehicles and smoke from diesel road vehicles to acceptable levels, thus making it possible for legislation to establish limits by a reasonable date. I can now tell you that the reply that was received from the Minister was not very encouraging. He stated that medical evidence so far showed that there was no necessity to introduce regulations to limit the emission of carbon monoxide from petrol-engined vehicles; and that as regards the smoke produced by diesel engines he considered that the existing regulations together with the provisions of the Road Safety Act of 1967 were sufficient. Now, I am only a layman and therefore am not in a position to argue with the medical profession. But, as a member of the general public I am as aware as anyone else of the stink and pollution that is produced by vehicles on our roads today. I am sure that this is apparent to every one of us in this hall whenever we are in a busy street. Similarly, although—as the Minister points out—there are regulations regarding the emission of smoke from diesel engines, one only has to drive uphill on one of our roads to see how many diesel-engined vehicles are emitting filthy black smoke. In other words, they are getting away with it. Now our technical friends assure us that it is quite possible for the motor industry to take steps to reduce these emissions both from the petrol-engined vehicle and from the diesel vehicle. Indeed, for those cars which we export to the United States of America and to some Continental countries it is already being done. But when we ask our friends in the motor industry why if they can do it for cars for export they cannot do it for cars being sold on the home market, we are told that it could be done but, because there is no legislation necessitating it and because it would probably put the price up by some small amount, they are disinclined to do it.

We thus seem to have reached a position of impasse. The motor industry is waiting for legislation from the Ministry of Transport; the Ministry of Transport is waiting for evidence that a large body of public opinion exists in this country which will demand less pollution from vehicle exhausts.

This seems to me to be a direct parallel with what went on before the passing of the Clean Air Act. Little progress was made until we had the dreadful killer smog of 1952. And then authority was stimulated to take action. Are we to wait until it is definitely proved that people die because of fumes from road vehicles before any action is taken?

In any event, whether exhaust fumes are detrimental to health or not, whether when idling in a traffic queue the fumes sucked into the car do or do not make people drowsy and more accident prone, there is no doubt that they are an invasion of our amenity. This is apparent to everyone and the general public are well aware of it. Why should we not protect our amenities? Why should we not have legislation enabling the research work of the motor industry to be implemented? We do not believe that the question of the increased cost of the car is of great significance. Indeed, we understand that if suitable devices in the way of fuel injection equipment or proper carburation are fitted to the modern car, these not only reduce the exhaust emissions but also give the motorist more miles per gallon. Surely this would more than compensate for the additional cost of the car?

Perhaps we shall have some factual answers on these questions at the session on Thursday morning.

I have just mentioned invasion of the amenities. This is a growing problem not only so far as air pollution as we understand it in this Society is concerned, but in many other spheres as well. For example, I consider noise to be a form of air pollution. I believe that I am not alone in this; I understand that a number of local authorities regard noise as one of their air pollution problems. Noise is a growing infringement of our amenities. And if we look around further we find that rivers and other natural water supplies, including the sea, are being polluted. I believe that all these pollutants of natural resources really are in the same category; they are all invaders of our amenities, and we cannot divorce one from the other. It is not uncommon, for instance, for water to be used to reduce air pollution. But are we really going the right way about things if the water which has been used to wash the pollution out of the air is then in its dirty state returned to pollute a river?

Our Society throughout its history has had a splendid record with those with with whom it has had dealings. It has always assumed what might be termed a reasonable attitude to the various problems of air pollution. It has been ready to consider both sides of the question, and it has been ready, when necessary, to make haste slowly. It has not tried to rush things, but has gone steadily along and now its achievements are not inconsiderable. It is my personal opinion that there is a future for the Society to take the lead in working with other similar bodies who are concerned with the preservation of our amenities and our environment.

Whilst we continue to act as the driving force for clean air in this country, we could start to become a driving force for the protection of our environment as a whole.

## The Clean Air (Measurement of Grit and Dust) (Scotland) Regulations 1968

These regulations came into force on 2 September 1968, they enable local authorities to require the making and recording of measurements of grit and dust emitted from a furnace covered by section 7(1) of the Clean Air Act 1956, the provision of the necessary apparatus and the supply to the local authority of the results of the measurements.

It is suggested that, when local authorities examine plans for furnaces or chimneys for the purposes of sections 6(1) and 10(1) of the Act, they should consider whether they are likely to make a direction under section 7 in respect of the furnace concerned and whether they should advise the firm to incorporate appropriate sampling points in the course of construction.

# THE CLEAN AIR ACT, 1968

Mr. Robert Maxwell's Clean Air Bill received the Royal Assent on Friday, 25 October, 1968—the last day of the Harrogate Conference, where it was described by one speaker as "Having teeth that are intended to bite".

Clauses 2, 6 and 8 to 15 inclusive of the Act will be brought into force on 1 April 1969. The remaining Clauses will come into operation later at dates yet to be announced.

To be known with the 1956 Act as the Clean Air Acts, 1956 and 1968, the new Act supplements, extends and in part repeals the provisions of the 1956 Act. Although it contains considerable powers under which local authorities will be able to act immediately it comes into operation, the Act is to a large extent a piece of "enabling" legislation by which the Minister of Housing and Local Government will be able to make Regulations and Orders further increasing or restricting its effect, providing exemptions from certain provisions and also repealing Local Acts.

## Dark Smoke from Industrial or Trade Premises

Section One will prohibit the emission of dark smoke from industrial or trade premises (as distinct from chimneys) and subject to any exemptions to be provided by the Minister, it will be an offence to allow dark smoke of whatever duration to be emitted from any premises used for industrial or trade purposes or premises not so used on which matter is burnt in connection with any industrial or trade process.

This section will prohibit the emission of dark smoke from burning on the ground, and it is anticipated that local authorities may use these provisions, where dark smoke is caused, in preference to Section 16 of the 1956 Act (Smoke Nuisances), although this latter section will remain operative. A defendant will be able to plead that the contravention was inadvertent, and that all practicable steps had been taken to minimize the smoke emission.

## Grit, Dust and Fumes

Section 5 of the 1956 Act (Grit and Dust to be minimized) will be repealed and replaced by Section 2 of the 1968 Act which gives the Minister power to prescribe limits on the rates of emission of grit and dust from a very wide range of furnaces, and there is also power in Section 7 of the Act to include "fumes" in the provisions of Section 2, thus limiting the emission of grit, dust and fumes.

Where no limits have been prescribed by Regulations for any particular installation, the occupier of the premises must use any practicable means there may be for minimizing grit, dust (and fume) emission.

It will be a future requirement of Section 3 of the 1968 Act, subject to exemptions which may be provided, that all new furnaces burning pulverized fuel, solid matter at a rate of 100 lbs/hour or more, or 1¼ million or more Btu's/hour of liquid or gaseous matter, shall be fitted with grit, dust (and fume) arresting plant which has been approved by the Local Authority and, in addition, the plant must be properly maintained and used.

These provisions are to be used in conjunction with Section 6 of the 1956 Act from which the reference to the provision of grit and dust arrested on "ovens" has been repealed, and the right of appeal to the Minister against a Local Authority decision not to approve arresting plant will be available in respect of a decision under the new legislation.

Both the Minister and the Local Authority have power to grant exemption from the requirement to install arresters. The Minister's powers are in respect of any particular class of furnace and will apply nationally, whereas the Local Authority exemption will be specific to a particular furnace installation on the application of the occupier of the building. When a Local Authority receive an application for exemption, they must give written notice of their decision within eight weeks, or longer, if agreed by the applicant. There is a right of appeal to the Minister.

Section 5 of the new Act extends the powers in Section 7 of the 1956 Act in regard to the measurement of grit, dust and fumes. These powers must be used in conjunction with the Clean Air (Measurement of Grit and Dust) Regulations, 1968, and the Local Authority will have power in the first instance to require the measurement of grit and dust emission from chimneys serving plant which burns solid matter at a rate of 100 lbs/hour or more, or liquid or gaseous matter at a rate of 1¼ million Btu's/hour or more.

Where a notice is served on the occupier of a building in respect of a furnace burning less than one ton/hour of solid matter or 28 million Btu/hour liquid or gaseous matter, he may serve a counter-notice on the Local Authority requiring the Local Authority to make and record the measurements of grit, dust (and fume) emission, and he will be obliged only to adapt the chimney for the purpose of allowing the measurements to be taken. There is no power in the Act for the Local Authority to recover the cost of the work involved in making the measurement, which they are obliged to do "from time to time".

## Height of Chimneys

The definition of "chimney" is extended by the new Act to include "flues" and to enable the height of an opening through which fumes may be emitted, to be controlled. "Fumes" are defined as "any airborne solid matter smaller than dust".

Section 6 removes from Building Regulations Control the approval of the height of a chimney serving a furnace; and thus the control of chimney heights under this section of the Clean Air Act, 1968 will become part of the Public Health Code normally entrusted to the Health Committee of Local Authorities. However, the control of the height of a "chimney" from which smoke, grit, dust or fume may be emitted and which does not serve a "furnace" will still be controlled by Section 10 of the 1956 Act and by the Building Regulations.

In assessing the height of a chimney, the Local Authority will be obliged to consider the same four points as in Section 10 of the 1956 Act, but will be required to give their decision in writing within four weeks of receiving an application. Otherwise the approval applied for shall be deemed to have been granted without qualification.

The only qualification which the Local Authority can attach to a consent to a chimney height is to restrict the "rate or quality, or the rate and quality, of emissions from the chimney" and they must give notice in writing of the reasons for including the conditions or, in the case of a decision not to approve the height of a chimney, of the reasons for reaching that decision and specifying the lowest height they will approve with or without conditions. There is a right of appeal to the Minister of Housing and Local Government against a refusal, or against the terms of any conditions.

It will be necessary to seek Local Authority approval for a chimney height when, after the operation of this section:—

(a) A new chimney (or a replacement chimney) is erected to serve an existing furnace, or a new furnace.
(b) The combustion space of a furnace is increased, and
(c) A new furnace is installed which replaces a furnace of smaller combustion space.

The Minister has power to prescribe the type of form to be used for an application for a proposed chimney height, and he also has power to exempt certain boilers or plant from the need to have an approved chimney.

## Smoke Control Areas

Parliament has expressed its displeasure with the slow speed of Local Authorities in introducing Smoke Control Orders by giving the Minister power in Section 8 of the new Act to direct a recalcitrant Local Authority to prepare and submit proposals for making and bringing into operation one or more Orders. If they fail to carry out his directions, or if the Minister rejects the proposals, he may make an order declaring the Authority to be in default and directing them to exercise their powers to make Smoke Control Orders within a specified time.

Section 9 of the new Act makes it an offence to acquire any solid fuel, other than an authorized fuel, for use in any domestic fireplace or industrial plant in a Smoke Control Area, unless that fireplace or plant is exempted from the terms of the Smoke Control Order. This section also creates the offence of selling any unauthorized solid fuel for retail delivery to a building or premises in a Smoke Control Area unless for use in an exempted fireplace. There is a defence if the defendant can prove that he believed and had reasonable grounds for believing that he was acquiring the fuel or delivering the fuel for use in an exempted building or fireplace.

These provisions are complementary to Section 11 of the 1956 Act and it will still be possible to take action against the occupier of a building in respect of smoke emission from a chimney when an unauthorized fuel is being used, or when conditions attached to an exemption are being violated with resultant smoke emission.

Section 10 of the 1968 Act varies certain provisions of the 1956 Act about the procedure for making and bringing into operation smoke control orders. In particular, it prevents a Local Authority from postponing the date of operation of an Order, made previously, for an aggregate of more than 12 months.

This section also enables an objector to a Smoke Control Order to appear at an informal "hearing" instead of at a public local inquiry, and it is thus anticipated that objections will be dealt with more speedily and at reduced cost to all parties, whilst upholding the rules of natural justice.

## Alkali Act Registrable Premises

Section 11 of the 1968 Act extends the exemption of registered Alkali Act premises from the smoke, grit and dust provisions of the 1956 Act to include an exemption for work subject or potentially subject to the Alkali Act and makes these premises subject to the smoke, grit and dust provisions of the Alkali Act.

Section 17(2) of the 1956 Act, which allows a Local Authority to apply to the Minister for power to prosecute the occupier of Alkali Act registered premises in respect of smoke, grit or dust emission will be repealed; but the similar provisions of Section 92 of the Public Health Act, 1936 in respect of "any dust or effluvia which is prejudicial to the health of or a nuisance to the inhabitants of the neighbourhood" will still allow the Local Authority to approach the Minister for Power to take action under the Nuisance procedure in respect of Alkali Act premises if nuisance to the local inhabitants can be proved.

The remaining provisions of the Act are amendments to definitions, new definitions, and consequential amendments of the 1956 Act.

The maximum penalties prescribed for offences under the 1968 Act are:—

| | | |
|---|---|---|
| Section 1 | Dark smoke from industrial or trade premises | £100 per day |
| Section 2 | Excessive grit and dust emission where limits have been prescribed | £100 per day |
| ,, | Failure to use "best practicable means" where no limits of grit and dust emission have been prescribed | £100 |
| Section 3 | Use of a new furnace without approved grit and dust arresters or where they have not been properly maintained or used | £100 per day |
| Section 6 | Use of a furnace without an approved chimney | £100 per day |
| Section 9 | Acquiring or selling unauthorized solid fuel for use in a Smoke Control Area | £20 per day |

The inclusion of high daily penalties is indicative that the Act is really intended to bite, and it is hoped that Local Authorities will take steps to ensure that its provisions will become effective as soon as possible after the Act and the necessary Regulations have been brought into operation.

## Smoke Abatement, 1818

On page 131 is a description of the newly developed N.C.B. appliance, the "Housewarmer", for burning bituminous coal smokelessly. It is interesting to note that 150 years ago, on 12 November 1818, a patent was granted to James Fraser, of Long Acre in the parish of St. Martin in the Fields, for his invention of a junction of tunnels in a boiler, for the purpose of Lessening the Appearance of Smoke, and for Lessening the Consumption of Fuel.

The Monthly Magazine of 1 May 1820 gives the following description of Mr. Fraser's invention.

> "This improvement consists in a vertical with a horizontal tunnel in a boiler, or in other words, both these tunnels are in the midst of the water. The horizontal tunnel is the supposed fireplace, and the vertical tunnel supplies the horizontal with fuel from above, so that the fire immediately under the vertical tunnel, on the top of which is a door and register; also when the smoke is required to be burned, this register will emit off sufficient air to effect combustion, and beat the smoke down into the ignited coals, and thereby lessen its quantity. The vertical hopper will also supply the boiler with a quantity of coals, so that for ordinary purposes, such as for heating by steam, it may be left several hours; supplying itself regularly with coals, without attendance. From the junction of tunnels above mentioned, the fire and hot air descend to the secondary flue under the boiler, pass nearly its whole length from back to front, then turns righthand and left under the bottom to the sides, and then to the chimney. There are two flues issuing from the fire or horizontal tunnel, which meet the main flue, and present a more enlarged surface of flame and hot air to the water, and these flues may be made to pass out at the ends of the boiler, parallel with the horizontal tunnel, and then be made common walltext. Bricks also may be placed at the flues and end of the fires, this will prevent the boiler from being burned, and will assist in bringing down the regular supply of coals from the vertical tunnel. The above horizontal tunnel is supposed the primary and essential flue; what he calls the secondary flue is, in fact, the primary one of many boilers now in use, and my primary and horizontal is their secondary one; but the junction of a horizontal, with a vertical tunnel opens a communication in the inside of a boiler, that independent of its convenience, presents many advantages, supposed unattainable in ebullition of ten hours' continuance, a more rapid combustion, and an enlarged surface."

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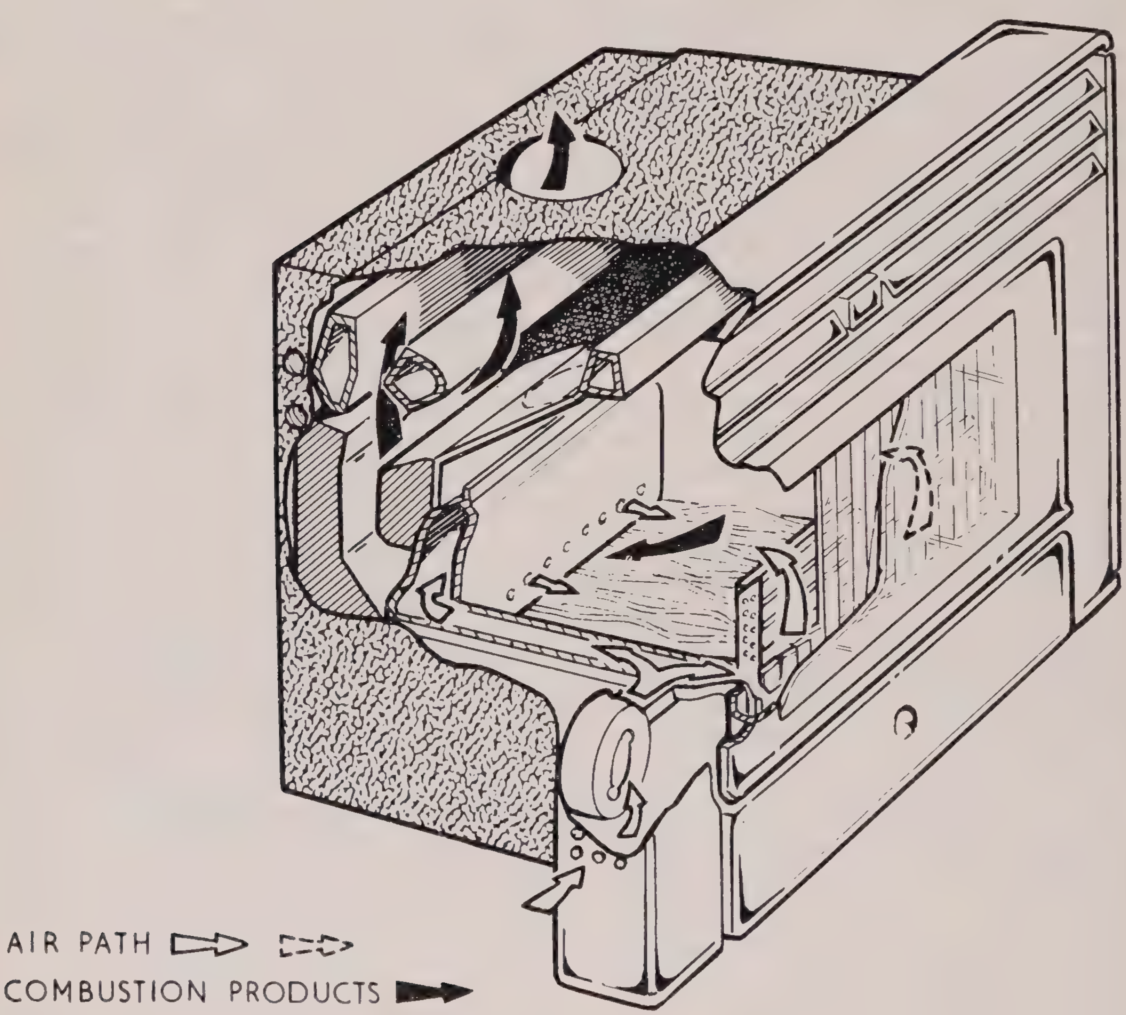
# Burning Bituminous Coal Smokelessly

## "Housewarmer" Seen Under Fire

Just one week after Lord Robens had told our Harrogate conference delegates about the newly developed N.C.B. appliance, the "Housewarmer", which would burn bituminous coal smokelessly, *Smokeless Air* was very glad to have an opportunity to see it under fire for the first time. The appliance was shown to the press on 30 October in Brighton in connection with the National Housing and Town Planning Conference and it was installed in some prototype Brick Panel Houses—another National Coal Board development. The model (still to be modified) on display, was indeed burning quite smokelessly and there was no smoke issuing from the chimney outside the house.

The "Housewarmer", a roomheater with backboiler is the result of two years' work at the National Coal Board's Coal Research Establishment at Cheltenham on developing a family of domestic appliances designed to burn ordinary coal smokelessly. Designed for continuous burning, the Housewarmer uses a small size of selected low ash bituminous coal—high volatile "washed singles". Smokelessness is achieved on the smoke reduction principle by what is known as "fan-assisted, down burning".



The N.C.B. Housewarmer

The fan, electrically-operated and consuming no more current than an electric light bulb, is mounted at one side of and within the casing of the appliance. It draws in air for primary combustion, directing it forward along a duct to the double-glazed window of the fire box. The inner window is of glass slats louvred vertically. The air current sweeps through the slats and is drawn through the firebed of burning coal. It carries the smoke and other products of combustion under an arch to a refractory-lined secondary combustion zone at the lower rear of the appliance. There air, also supplied by the fan but separately routed for pre-heating, is forced through jets to complete the combustion process by burning off the smoke that would, if passed up the chimney offend against clean air. The remaining clean hot gases rise to pass over the surfaces of the water boiler, giving up heat to the water inside before being expelled through the flue, while some of the heat from the firebed is passed into the double casing of the Housewarmer and issues through grilles as warm air for convection heating.

It is said that the running costs for a Housewarmer will be far lower than for any domestic appliance of a comparable heat output relying on prepared smokeless fuels.

Following limited field trials at selected sites over the past year, 2,000 of these appliances are to be installed this winter in houses, mainly in the Midlands. If this extensive test proves the Housewarmer capable, under varying operating conditions, of performances comparable with conventional roomheaters, a production programme will be put in hand to make the appliance widely available to local authority and large developers of private housing. It is not planned immediately to offer the Housewarmer to the retail market as it requires a selected fuel and the National Coal Board are anxious to ensure that a first-class service is provided.

## Effect of Air Pollution on Plants

The letter reproduced below originally appeared in the Gardeners' Chronicle. It will be of interest to many of our readers and some may well wish to communicate with the laboratory.

Sir,—We are investigating the effect of air pollution on plants, and are studying plants grown in clean air and in polluted air in normal glasshouses. Our air pollution research programme was initiated in March 1968 after new facilities were completed. We have glasshouses equipped with activated carbon filters that effectively remove ozone, a major pollutant in photo-chemical smog. We are interested in comparing performance of plants in the filtered air with that of plants in unfiltered air in as adjacent section of the glasshouse.

We have found acute air pollution injury on leaves of some plant species in the unfiltered air, but no visible injury in the filtered air. Measurements of plants are made, however, in glasshouses, with and without filtered air, to detect possible differences in the rate of growth. When injury is severe, the total growth (dry weight) of very sensitive plants in unfiltered air may be only half that in filtered air.

The laboratory also has facilities to fumigate plants with known concentrations of pollutants in chambers, with controlled emphasis on the effects of ozone and sulphur dioxide. Two scientists are using laboratory procedures to evaluate the effects of these pollutants on vegetation. We are interested in the nature of the action of air pollutants on plants in the hope that such information may prove helpful in developing methods to reduce injury by air pollutants.

A goal of our laboratory is to obtain more information on the response of different plant species to air pollutants than is now available. We know that the response of plant species, and even of varieties within species, to air pollutants varies widely. Professional gardeners and crop specialists have shown much interest in our results, and we would like to know which plants and shrubs are of most interest to your readers.

With regard to air pollution resulting from motor exhaust fumes, white pine and London plane have been found to be among the most sensitive species.

**Howard E. Heggestad**

*Plant Air Pollution Laboratory,*
*United States Department of Agriculture,*
*Agricultural Research Service,*
*Crops Research Division, Beltsville, Maryland, U.S.A.*

# News from the Divisions

The President with the Prizewinners in North West Essay Competition.

## North West

Earlier in the year, the North West Division conducted an essay competition for children attending school in Manchester and Salford. About 3,000 children were eligible to enter the competition, and in all 176 entries were received in the two age groups concerned, 10–14 years and 14–16 years.

Twenty-nine entries were awarded prizes, and the two winners of the first prize of £25 in each age group were presented with their prizes by Sir John Charrington, the President of the Society, at the Opening Session of the Clean Air Conference at the Royal Hall, Harrogate on 22 October, 1968. The winner in the junior age group was Michael J. Murphy of St. Augustine's Grammar School, Wythenshawe, Manchester, and the winner in the senior group was Lynne Pethybridge of Pendleton High School for Girls, Salford. We congratulate them on their success and are very pleased to print their essays below.

*W. Pollitt, Hon. Secretary*

## Clean Air

### *by Lynne Pethybridge*

In the early Middle Ages, when the only fuel in common use was wood, the regular use of coal was frowned upon by the authorities on account of the offensive smoke and dirt which it caused. A Royal Proclamation of 1306 prohibited metal-workers from using coal in their furnaces and one transgressor of the law was even hanged. The increasing difficulty in obtaining wood, however, led to a greater demand for coal, so that by the middle of the 17th century its use became fairly general, both for supplying power to the rapidly expanding industries and for heating the rows of houses which were springing up. So the industrial revolution had arrived, and with it, what was described at the time as "an impure and thick mist", which affected Londoners by "corrupting their lungs and disordering the entire habits of their bodies". But people were aware of the unhealthy consequences of allowing smoke from coal fires to escape into the air and were deeply concerned. They refused to be dissuaded by the increasing complexity of the problem of smoke pollution and the new problems which tended to arise, but made their ideal a clean, bright Britain which would have healthy, unpolluted air.

The most serious and urgent problem to overcome was the pollution which arises from the combustion of coal, oil and their derivatives. Smoke—unburned, wasted fuel—came largely from industrial sources and railways, but for each ton of coal burnt, domestic chimneys produced twice as much smoke as industry and discharged it at a much lower level. With the smoke came invisible gases, the most important of which were the oxides of sulphur, and dust and grit. A committee was set up, under the chairmanship of Sir Hugh Beaver, to investigate air pollution, and as a result of the committee's findings and recommendations, the Clean Air Act was passed in 1956, limiting the emission of dark smoke, reducing grit and dust to a minimum, ensuring that new industrial fuel should be smokeless, and aiming to entirely do away with domestic smoke. This was indeed a great step forward, for the effects of air pollution are most severe, and therefore its restriction, if not its prevention, is imperative.

The most serious effect of air pollution must certainly be that on human health, and there is sufficient information available to make it extremely clear it is injurious to both physical and mental health, fostering disease and causing death. Fog is a natural occurrence and is normally harmless, but when it persists over a town, emissions from chimneys and vehicles become trapped within the fog layer. The London Fog of 1952 resulted in the deaths of 4,000 people—a tragic, but clear indication of the seriousness of pollution, especially when it becomes concentrated close to the ground. However, the consequences of the continuing air pollution that persists year in, year out, over wide areas of the country are equally important if not quite so sensational. There is a clear association between pollution and the incidence of bronchitis and other respiratory diseases, and in general it is the industrial towns liable to heavy pollution that have the highest death rates. To aggravate this, the pollution cheats industrial towns of their sunlight, thus reducing resistance to infection and retarding recovery from illness. And even if town dwellers manage to escape the physical effects of air pollution, the psychological effects of reduced light and sunshine may be no less serious. It is extremely depressing trying to keep a home clean and fresh when dirt and grime are constantly returning to soil wallpaper and blacken paint. Gardeners are disheartened to find that their plants are stunted because of the reduction of sunlight by smoke particles firstly in the air and then on the leaves. Clothes become soiled, tar makes soot stick to surfaces and renders them difficult to clean, and life seems to be an endless torment of cleaning things for them only to be just as dirty again in no time at all.

The formation of sulphuric acid from sulphur dioxide has a serious corrosive effect of the stonework of buildings. Manchester Cathedral was once able to exhibit the lovely red Colleyhurst stone of which it was first built, but industrialism eroded it away long ago and it had to be renewed with harder Derbyshire stone. Even this became begrimed by soot and it is only recently that efforts have been made to clean this and other equally beautiful buildings so that they may be fully appreciated. Such cleaning and renovation work obviously costs money, and it is hoped that clean air will made such large scale cleaning necessary much less frequently.

Indeed when the economic effects of pollution are considered it is surprising that measures were not taken long before 1956 to greatly reduce air pollution. Laundry and domestic cleaning, the cleaning, painting, and repair of buildings, the corrosion of metals, which entails the cost not only of replacements but also of providing protective coverings, damage to goods, additional lighting and extra hospital and medical services, are all expensive consequences of polluted air. Then there is a loss in efficiency because of the effects on agriculture of damage to soil, crops and animals, interference with transport and reduced human efficiency due to illness. All these can be measured in terms of money but many things such as health and happiness cannot. Also when coal is burned some of the fuel is not used so that money is lost through incomplete combustion—one of the main causes of smoke. Thus air pollution is a social and economic evil; not only doing untold harm to human health and happiness, but also a prodigal waste of material resources. Expenditure to cure it is only a fraction of the savings which result from the cure so that the case for clean air is overwhelming. In the course of a day we breathe in much air—five to six times as much by weight as the food and drink we consume—but although we pay officials to ensure that our food and water are pure we are content to endure a dirty atmosphere without complaint.

Fortunately for the nation, not everybody was willing to sit back and let towns disappear beneath a dense pall of smoke. Movements were begun, and much progress has been made. The greater use of smokeless fuels in homes and improved furnaces in factories with more efficient firing have practically eliminated visible pollution by smoke. Sulphur dioxide is still emitted from chimneys but is dispersed at as great a height as possible. Perhaps the solution would be found in using the coal at the pit-head to manufacture coal-gas and electricity which could then be distributed to provide power for heating, lighting and industry. However, positive action has been taken, and since clean air is obviously a huge benefit to everybody, encouragement for further progress is not lacking. Much more, indeed, remains to be done, and although new problems such as the pollution from the rapidly-growing number of cars on today's roads, tend to present themselves, the foundation stone has been laid for a clean and healthy Britain.

## The Danger of Air Pollution

### *by Michael Murphy*

£20,000 is a large amount of money. It is the amount of money being paid to clean the statue of Prince Albert in St. Peter's Square, Manchester. It is also costing many thousands of pounds to clean Nelson's Column in London. More money will be needed to prevent them becoming covered with grime because of polluted air. Terrible? Of course it is. But these are only material things. There is a much greater toll in human lives and suffering taken by this great menace.

A little boy is living in London. His father is dead but he lives happily with "mummy". The date is December 1952. One day there is fog, or rather it seems like fog to the boy but is has a peculiar, bitter taste. The boy and his mother are out when this smog falls. They hurry home. His mother arrives home, coughing excessively. She telephones for the doctor who arrives in time to diagnose acute bronchitis. The mother had contracted bronchitis through the effects of a previous smog. This further smog had aggravated her chest and brought on this attack. A few minutes later the boy was an orphan. He cried bitterly but no amount of crying could bring his beloved mother back. He grows up in an orphanage, a bitter, resentful, young boy, hating dirt. A woman dies and a boy's character is changed.

"Awful", replies the man in the street, "But it could never happen to me." This is the attitude of many people. They try to run away from the facts. They cannot. They could have been one of the 4,000 killed in that great smog in London. Or one of the thousands more who contracted disease because of it. Steps have now been taken to ensure that such a disaster can never happen again but there are still minor smogs and results of them. Minor to the outside world but major to the family of a person stricken with disease, or worse still killed by the smog. Why do these things happen? We have no one to blame except ourselves. Domestic fires are the major source of air pollution. Even as these are slowly suppressed by the setting up of smokeless zones fumes from the family car pollute the air. As the number of cars grows, so the danger from them grows for electric cars have not yet been fully introduced and diesel cars are less favoured than their petrol-driven counterparts. The third source of pollution, industrial waste, is now much smaller. Fuel burning is much more efficient and more and more industries are using electricity as their source of power. High chimneys also help by dispersing smoke into the upper atmosphere. How did smoke come to be there; how is it formed?

Smoke is formed when fuel is not burnt completely in air. As well as smoke, grit and dust from coal also escape to pollute the air. Deadlier than these is sulphur dioxide, a poisonous gas. This gas is also dangerous to buildings for when mixed with water it forms sulphurous acid. Why do people have to use these fuels? Could they not use smokeless fuel or central heating? The excuse that they cannot afford the money is invalid. The Government grants money to people to enable them to use smokeless fuels. All that people do by ignoring this offer is to cause discomfort, ill health and filth to become ripe. Fine particles of smoke enter the lungs and remain there to cause discomfort, disease, death. Smoke also blocks the health giving rays of the sun. Even the gloom created by smoke is psychologically harmful. Plants too are harmed by polluted air. People suffer through less yield from crops. Beautiful parks are blackened, and the plants in them destroyed, by smoke. Smog—produced when a large mass of polluted air meets fog—is another danger for it causes blockage of the air passages.

The great tragedy is that people are so ignorant of the danger of air pollution. People light coal fires and drive to work in fume-spreading cars. Their children play happily in front of a smoky fire. Mother moves them away from the smoke. "Why do that?" they cry. They do not know what smoke can do. But then perhaps they will never know of these things for the future of Britain's air seems bright. The Clean Air Act of 1956 has already done much to keep air clean. Men must, and do, help to keep the air clean by enforcing this act. New electric cars are being introduced which trail no deadly carbon monoxide fumes behind them—smokeless zones and fuels are now replacing that great air polluter, coal. More and more people are becoming aware of danger from polluted air. Some, such as my mother, know because of its effect on them. Others hate the dirt of smog or have read of its danger.

They can console themselves, however, with the prospects of the future. Smog is nothing but a definition in a dictionary. Buildings shine bright and clean. People do not risk disease and death by breathing the air which is essential to them. Now everyone knows about the danger of smog, they learn about it at school. Electric heaters and battery-driven cars have replaced the old coal fires and petrol-driven cars. Children play happily in heavy industrial areas. Where is the smoke and smog? There is none in the new, clean, Britain.

## South East

When the Division met at the Society's headquarters on Tuesday, 1 October, the main business was dealing with matters of topical interest appearing in the Hon. Secretary's report which was being presented to the members.

The first of these was arrangements for a course on the Measurement of Grit and Dust to be held early in 1969, the theoretical part of the course to take place at Tottenham Technical College and the practical work to be done at B.C.U.R.A., Leatherhead for a total course fee of £25. The Society had formally supported the institution of this course early in 1968.

### Visits

Visits for the year had been very badly supported; only 10 members visiting Queen Mary College Nucleonics Laboratory, 12 the Snowdon Colliery, Kent, and only nine the Coalite Plant. There was also a very disappointing attendance at the meeting of the Divisional Council at Thurrock despite special efforts made by the host U.D.C. for the meeting.

### Slowing down of Smoke Control Programmes

A recent article in the *Daily Telegraph* had drawn attention to the slowing down of clean air progress and although this process was much more pronounced in the North and Midlands, the South East had not completely escaped. Members were asked to report the position in their own localities as to whether progress was being maintained or not and to make suggestions if the latter was the case.

### N.C.B. Publicity

The use of the slogan "Stick to COAL if you're on it—Convert to COAL if you're not" by the National Coal Board had been noted. These had been sent on communications to a house in a Smoke Control Area. As a result the Deputy Chairman and Director of Marketing of the Board had been approached but both appeared to think that only the hypersensitive or excessively pernickety could possibly raise any objection to the wording. In a recent letter the Deputy Chairman had stated that slogans used on their envelopes were changed from time to time and that a change was due shortly.

*J. S. Hodgins, Hon. Secretary*

# LETTERS

*The Editor,*
*Smokeless Air*

Sir—Mr. K. Williams, of Cheadle, in a letter in the Autumn issue, page 49, advocates the ending of the use of smokeless solid fuels in smoke control areas, and urges the Society to advocate such a policy. Ideally, there is a good case for doing this, and an even better one for ceasing to burn fuels at all—the build-up of carbon dioxide in the atmosphere is causing anxiety—and to use only energy from nuclear and hydro sources. In practice, however, we have no choice other than continuing to burn the fossil fuels, including those in solid form.

To depend entirely on gas, electricity, and sulphur-free oil would require a far greater expansion of production, taking up a considerable length of time, than is at present envisaged. Not only would the remaining fuels have to be able to take the normal winter heating load, but they would have to have the reserve capacity to meet the emergency demands of exceptionally severe weather—demands which solid fuel can cushion without heavy capital expenditure. To abolish solid smokeless fuels and wait for such developments would set the clean air programme back by years.

Mr. Williams is concerned about smoke that occasionally comes from solid smokeless fuels, but if this is of any significance the remedy surely is to improve such fuels and not to abolish them. Any such smoke is not likely to be more than a tiny fraction of the smoke from the bituminous coal being replaced.

Sulphur dioxide is the real remaining problem, but here too, the use of smokeless fuels in efficient appliances can greatly reduce its concentration, as shown in the Society's report on *Sulphur Dioxide as an Air Pollutant*. The concentration of sulphur dioxide is also being further reduced by the fact that present-day trends mean that it is being emitted from about only one chimney out of three in the newer smoke control areas. (See the West Bromwich report in the Autumn issue, pages 75 and 76.) These two factors are leading to a situation where the sulphur dioxide from domestic sources will be only a fraction of what it was. And, most importantly, its harmful effects are more than likely to be substantially lessened by the absence of smoke particles. (Recent research, reported by Professor P. Lawther, gives added weight to this view.)

Although we would all like to go for the ideal, we have to weigh all the factors involved from the viewpoint of what is possible here and now, and do what is best on balance. In my view it is far better to get rid of smoke as quickly as we can, using solid fuel to help, and to put up with what sulphur dioxide continues and cannot be avoided.

Yours, etc.,

*Epsom, Surrey* ARNOLD MARSH

*The Editor,*
*Smokeless Air*

Sir—I refer to the review of the 104th Annual Report on Alkali Works which appeared in the Autumn edition of *Smokeless Air*.

The review did not, in my view, accept the invitation to criticism which was, perhaps deliberately, extended by the Chief Inspector, in a more than usually contentious report.

Quite often, when reading the report, I was struck by the thought that the Chief Inspector feels that if he really let himself go his requirements would prove an intolerable burden to industry. But as he says, increased costs to industry are passed on to the consumer. It is therefore more a question of what the consumer can afford than what industry can afford.

The Chief Inspector gives as an example the cost of air pollution control equipment at a power station—£3½ million—and this sounds a lot of money. I wonder, however, what this figure would be if expressed as a fraction of a penny per unit of electricity generated by this station during the useful life of the control equipment.

I suspect that quite a few decimal places would be necessary to express this figure and that it would be so small that few would hesitate to pay it.

Industry obviously has a very high regard for the Alkali Inspectorate; and well it might. Whatever intention Parliament had in mind in creating the Inspectorate (and one has a sneaking feeling that it was for the protection of the public) it is clear that it functions largely as a free technical advisory service to the chemical engineering and allied industries.

Whilst a N.I.F.E.S. report on a small laundry boiler might cost the proprietor around £50 the giants of industry have the benefit of the Alkali Inspectorate's knowledge, experience and expertise for nothing more than eternal gratitude.

Once again the Chief Inspector defends his policy of not taking legal proceedings and in support of this policy he cites the case of a Local Authority taking "successful" proceedings on six occasions against the same scheduled works.

At least this indicates that on six occasions a bench of Magistrates was convinced that a nuisance existed and that the best practical means had not been taken. Is it really suggested that if a works is causing an intolerable nuisance and generally behaving in a loutish manner that it should be permitted to carry on until some official body has solved its problems?

Although the report stresses the usefulness of prosecution in the case of careless or deliberate offenders it goes on to say that on only three occasions in the past 47 years have court proceedings been brought. This must establish the operators of scheduled industries as the most careful and law-abiding set of individuals in existence.

Perhaps a happy solution to the Inspectorate's distaste for prosecutions and its penchant for the advisory side of its duties would be to set it up in its entirety as a self-supporting (or even profit-making) technical advisory service to the chemical engineering and allied industries on the lines of N.I.F.E.S., and replace it with a purely enforcing body. At least this might ensure a steady supply of clients for the new advisory service, all eager for a rapid solution to their problems.

I would not like it to be thought that I do not appreciate the difficulties facing the Inspectorate nor that I do not recognize their many successes. I simply feel that if they could get rid of the inhibiting tradition about prosecutions they could be even more successful and earn the respect and gratitude not only of industry but of the public too.

Yours, etc.,

*West Drayton, Middlesex* JOHN S. HODGINS

*The Editor,*
*Smokeless Air*

Sir—With reference to the article on the North Sea gas treatment plant being erected at Bacton and the public enquiry on same published in the last issue of *Smokeless Air*, as an industrial research chemist by profession, I feel the following points should be made:

(a) Re the phrase "Up to 94%"; isn't this really, rather a dishonest way of quoting the percentage 'impurities' removed? One would think any responsible authority would quote a *lower* limit as well (as it stands, it means anything from 0 to 94% of the impurities will be removed!).

(b) If up to 94% of the sulphur can be removed using the plant as it stands, almost certainly ALL the sulphur (i.e. 100%) could be removed if they really had to—or if they could make a lot of money out of the product they are recovering. A certain amount of money would have to be spent on research into improving the catalyst they use and/or devising a method of recycling the effluent gases through a second catalyst or treatment bed; but I am sure it could be done—and *would* be if there was a financial incentive—industrial research chemists in the pharmaceutical, etc., industries are doing it all the time!

(c) If by removing 94% of the hydrogen sulphide they expect to recover 6–7 tons of sulphur a day, it is odd that on burning off the remaining 6% they get 2·4 tons of $SO_2$?

Finally, three miscellaneous clean air points:

(i) It seems ironic to me that to make those brands of natural gas which are free of sulphur safe for the consumer to use, a sulphur-containing odiferous compound is added (admittedly in only small amount); why not use one of the combustible organic compounds which, although having a distinctive smell, are *free* of sulphur?

(ii) Although we welcomed the change made by B.R. from steam traction to diesel a few years ago, it is becoming increasingly apparent that, perhaps due to inadequate maintenance, many of the diesels, both main-line locomotives and suburban 'diesel units' in operation on the lines out from King's Cross, St. Pancras, and Paddington stations, to my own knowledge, throw out a great deal of smoke on occasion—particularly, it appears, on 'revving up'—often unnecessarily—the engines. Is Mrs. Castle's 'diesel-lorry smoke legislation' applicable to B.R. diesel locos? Why aren't the motors turned off when the train is standing for some time in a terminus—waiting to be shunted out or to leave?

(iii) Since the major smoke problem remaining is domestic smoke, and since excessive smokiness of domestic fires is usually caused by ignorance on the part of the householder—for example, heaping on in one go a large amount of dusty coal, or even kitchen refuse—might not the N.S.C.A. consider putting a discreetly worded advertisement or notice in selected local newspapers covering certain of the densely populated suburban, but still uncontrolled, areas pointing out the anti-social nature of this kind of behaviour and giving tips on how to minimize smoke production (e.g. kitchen refuse on compost heap, or in dustbin to be disposed of by local authority in efficient incinerator; coal dust best used only in small amounts at a time and mixed with large pieces of coal; slow-burning stoves perhaps(?) best left going overnight since most smoke produced on lighting them up from paper and sticks in the morning). The widespread use of natural gas will alleviate this problem of course: to look out over a mid-west Canadian town of 100,000, all living in centrally heated comfort, on a winter's day with the temperature at 60°F. or more below freezing point and not see anything more than small puffs of pure-white water vapour from the burning of the gas—to give $CO_2$ and water—in the clear air has to be seen to be believed!

Yours, etc.,

*Harpenden, Herts.* J. B. DAVIS

*The Editor,*
*Smokeless Air*

Sir—The writer attended the Wednesday forenoon session on chimneys at the recent Clean Air Conference at Harrogate. In addition we exhibited in conjunction with Kinnear Moodie (Concrete) Ltd. the pre-cast concrete chimneys which we market on behalf of Kinnear Moodie in the U.K.

On listening to the various papers and discussions, I was surprised at the emphasis given to mild steel chimneys and aluminium clad chimneys, and in fact the only reference given to any other type of chimney was the large multiple flue stacks used for the modern power station.

You must appreciate that the double-skin chimney has only come to the fore in the post-war period, whereas traditional brick and concrete chimneys have stood the test of time over many years and are still the most efficient and most popular means of chimney construction. Obviously steel chimneys have their limitations, particularly in height, but at the same time they fulfil a purpose particularly in the industrial field where life expectancy of the chimney is not so important.

Surely in a general paper such as was given on chimneys as a whole, more reference should have been made to the brick and concrete type construction, particularly as we had on show a pre-cast concrete chimney within the Exhibition Hall, whilst we saw no evidence of the double-skin chimney so often referred to in the morning session on chimneys.

Unfortunately time did not allow for further questioning and discussion, but I would like to draw attention to one point which is completely misleading, delivered in the paper given by Dr. Albert Parker. It is referred to in his paper on heat loss in chimneys and acid dewpoint, and repeated in the pre-prints—page 37.

It suggests that if there is a risk of acid condensation in a chimney, the inner walls should be made of a non-porous acid resisting material. Bricks manufactured of Diatomaceous Earth, quarried in Denmark—and more commonly referred to as Moler—have been successfully used as a hot face lining in chimneys since the early 1920's, and this is still the most favoured hot face lining for horizontal flues, flues within buildings and chimneys that serve boiler plants, incinerators and industrial plants, and even power stations. It is a highly porous material and it is, in fact, an insulating brick but as a material has acid resistance of 96% as tested by British Standards, as opposed to the conventional acid-resisting brick which is 99%. Contrary to what may be expected, it is less permeable than a dense firebrick where gases are concerned, and furthermore by its insulating properties it holds the heat in a chimney, thus preventing a cooling of the gases below acid dewpoint.

Reference is given in the paper to the fact that there are occasions when gases enter the chimney at a temperature already below dewpoint, and whilst this is often claimed in specifications, we have had difficulty in finding any proof that this does, in fact, happen. On the other hand, there are undoubtedly cases where gases have entered the stacks at temperatures well above dewpoint, and have been cooled within the stack as a result of coming into contact with acid-resisting bricks, which have had the effect of cooling the gases and creating the conditions which they have been installed to resist.

Another most important point to remember when discussing bricks for linings in chimneys is that the weakest point is in the joint, and unless the right materials are used in the joint and a high standard of bricklaying, the resistance of the brick itself to the effects of acid are of little use.

Finally, I would like you to know that there is a committee working at the present time in creating a new standard for concrete chimneys with particular reference and recommendation for the lining materials, and I am sure that your readers would welcome this publication when it is available, which follows up British Standard 4047 on the lining for steel chimneys.

Yours, etc.,
W. J. Brown,
Managing Director

*Refractulation Ltd.,*
*London, S.E.9.*

# INTERNATIONAL NEWS

## EUROPE

### Council of Europe—Declaration of Principles on Air Pollution Control

In the summer of 1964 a European Conference on Air Pollution, convened by the Council of Europe, was held at Strasbourg. The United Kingdom were represented by a strong delegation of experts and administrators. One of the results of this Conference was the setting up by the Committee of Ministers of a Committee of Experts on Air Pollution to make a study and comparison of the legislative and administrative measures in force in the various member states for the control of air pollution, with a view to the possible standardization of such measures. This Committee on which the British Government were represented by delegates from the Ministry of Technology and the Ministry of Housing and Local Government decided to draw up a declaration of principles for the control of air pollution, which would serve as a guide line for legislative and other action by member countries.

The Declaration was completed in 1967 and submitted to the Committee of Ministers, who by Resolution (68)4, adopted on 8 March, 1968, approved the Declaration, recommended the Governments of member states to bear in mind the principles set forth in the Declaration when framing legislation or regulations in the matter of air pollution, and asked them to give the Declaration the widest possible publicity. We are pleased, therefore, to publish the Declaration in *Smokeless Air*.

Although the Declaration is not itself a statement of British Government policy, the Government endorse it in general terms. With the exception of the provision for European standards for motor vehicles and fuel-burning appliances, and for pollution in frontier areas, the practice in the United Kingdom accords with the principles set out in the document.

### DECLARATION

#### PART I

**Preamble**

As air is essential to life, its natural quality must be maintained in order to safeguard man's health and well-being and to protect his environment.

This natural quality of air may be affected by the introduction of a foreign substance or by a significant variation in the proportion of its components.

Air is deemed to be polluted when the presence of a foreign substance or a variation in the proportion of its components is liable to have a harmful effect or to cause nuisance.

The member states of the Council of Europe will take the necessary legislative and administrative action to prevent or abate air pollution from all sources in accordance with the principles set out below.

## PART II

### Principles

(1) *Liability of those causing pollution*

Legislation should provide that whoever causes or adds to air pollution must, even where there is no proof of damage, keep such pollution to a minimum and ensure that impurities emitted are properly dispersed.

(2) *Basis of regulations*

Legislation on air pollution control must be based on the principle of prevention.

In each particular case where the circumstances so require, the competent authorities should be in a position to enforce appropriate practicable technical measures, having due regard to the degree and frequency of pollution, the geographical situation, present and future population density and all other relevant factors.

Prevention may be regulated differently according to the nature of the source of the pollution:

(a) where the setting up of new installations or the alteration of old installations is likely to contribute significantly to air pollution, they should be subject to individual authorization laying down specifications for siting, construction and operation designed to limit emissions; special regulations might be issued for existing installations;

(b) installations which individually contribute less significantly to air pollution may nevertheless be subject to general operating specifications if, for example, their proximity to each other might lead to a significant concentration of pollutants in the neighbourhood;

(c) motor vehicles and mass-produced fuel-burning appliances should be subject to general provisions; since motor vehicles circulate across frontiers, uniform European standards for their construction and operation should be established as soon as possible; such standards might also be envisaged for mass-produced fuel-burning appliances which are the subject of international trade.

(3) *Supervision and implementation*

Member states should set up or cause to be set up administrative machinery:

(a) to ascertain the nature and extent of pollution;

(b) to check compliance with regulations governing installations, motor vehicles and fuel-burning appliances;

(c) to take such action as may be required to bring about the necessary improvements.

(4) *Adjustment to technical and scientific progress*

Legislation should be so conceived that due account can be taken of new processes, technical improvements and scientific advances.

(5) *Special measures*

Apart from measures applicable to all areas, there should be legislative provision for special measures to be applied to zones requiring special protection, to heavily polluted areas and in cases of emergency.

(6) *Financing*

The cost incurred in preventing or abating pollution should be borne by whoever causes the pollution. This does not preclude aid from public authorities.

(7) *Pollution in frontier areas*

Pollution in frontier areas should be the subject of joint study by the countries concerned, in accordance with a procedure to be laid down.

(8) *Town and country planning*

The planning of urban and industrial development should take into account the effects of such development on air pollution; adequate consideration should be given by planning authorities to the maintenance and creation of green spaces.

### PART III

### Government aid for research

In order to make air pollution control more effective, governments must encourage study and research, at national and international level, on the technical means of preventing or abating air pollution, on the dispersal of pollutants and on their effects on man and his environment.

## NEW ZEALAND

# 1967 Report of the Chief Chemical Inspector

The ninth annual report of the Chief Chemical Inspector of New Zealand begins with a quotation from the U.S. Congressional Record appropriate to all industrial countries, "Pollution is a people problem and because the number of people in our country and around the world is increasing our pollution problem is bound to increase". The report then goes on to remind readers of the similarity of the Chemical Inspectors' responsibilities to those of the Alkali Inspectors of Great Britain, their primary concern being with the potential for serious air pollution of major industry in its more technical and specialized processes. There is another wider responsibility of government expressed by the Board of Health in 1961 and endorsed by the then Minister of Health which is quoted in the report, "A national policy on air pollution control should be designed to allow the industrial and urban development of this country to proceed in such a way that loss to the community of the amenity of fresh unpolluted air is minimized and no recognizable danger to health is created".

In reviewing the year, the report states "Measurement in itself presents no solution but it is a step which is increasingly essential both for practical purposes and because we live in a society which places more importance on figures than words". The New Zealand Inspectors attribute effective control to the amount of effluent source testing carried out, often under unpleasant and difficult conditions.

In proportion to larger and more industrialized countries the pollution levels in New Zealand are still comparatively low and in Christchurch, Auckland and other centres never approach the health danger threshold. However, increases have been reported in the year under review and the Chief Chemist confesses to a temptation to attribute these increases to loss of production of low sulphur bituminous coal following a disastrous explosion in the producing mine.

A new major source of sulphur dioxide was a 240 MW oil fired power station using residual fuel of a high sulphur content. Dispersion of flue gases from this station is by a 400 feet chimney currently the largest in the country, but soon to be supplanted by the building of a much higher chimney for the 600 MW station at New Plymouth operating on 3 to 4% sulphur fuel. A study of chimney costs has shown that every 1lb of sulphur dioxide released into the atmosphere from burning of fuel requires the expenditure of N.Z. $100 in providing a chimney of sufficient height to disperse it safely—a really big one can cost N.Z. $2,000,000.

Twenty-two health inspectors have completed a first course run by the Health Department in air pollution control. A second course attracted an enrolment of about 70. The examination at the end of the courses is that of the Royal Society of Health for smoke inspectors though much unpublished technical information specially related to New Zealand conditions had to replace existing text books.

The chemical inspectors have continued to address meetings both technical and lay and considerable time and thought has been given to public relations as well as support to air pollution symposia held by other services. Reference is made to Parliament showing increased interest in air pollution matters though a worsening of the economic climate during the year has led to the deferment of a few control proposals.

The Report contains a full list of chemical works and this shows 45 factories engaged in mineral processing and 75 in animal products. Local authorities who have adopted the Smoke Regulations of 1964 are listed together with the dates of commencement.

## Clean Air in Greenwich reduces the Death Rate

The Health Committee of the Borough of Greenwich reported in August that the number of deaths among old people from pneumonia and influenza has fallen and that this is partly due to the success of the Council's clean air scheme which was started in 1956. The number of old people suffering from these diseases has been reduced from 231 in 1957 to 32 in 1967.

## Obituary – Mr. R. L. Martindale

We regret to announce the death in September last of Mr. R. L. Martindale of Liverpool, who had long been associated with the cause of clean air and was an individual member of the Society.

# REVIEWS

## National Coal Board Report and Accounts for 1967–68

*H.M.S.O., respectively 7s. 6d. and 17s. 6d. net.*

During the year ending 30 March 1968, the Board, after charging £54·3 million for depreciation made an operating profit of £34·6 million, which after paying £34·2 million interest left a surplus of £0·4 million, a return of 5·2 per cent on average capital employed.

The saleable output of the coal amounted to 170·9 million tons, including 7·1 million opencast and 1·1 million from licensed mines. 439,000 tons of coal were lost through disputes compared with 1,707,000 tons during the previous year. On the other hand losses through absence increased from 17·3 to 18·2 per cent, a problem that the Board and the Unions seek to solve.

Total disposals of coal at 164·4 million tons were 6·8 million tons lower than in the previous year, leaving an increase of 6·5 million tons, to 26·8 million tons of undistributed stocks.

During the year 62 collieries employing 34,000 men were closed leaving some 360 in operation.

The Opencast Executive made a profit of £6·3 million at 18*s.* 6*d.* a ton, the coking plants a profit of £1·1 million, and manufactured fuel and by-products an aggregate profit of £1·8 million. The Brickworks made a profit of £97,000.

The saleable output of coal was disposed of—69·2 million tons to power stations, 13·6 to gasworks, 23·1 to coke ovens, 20·1 to industry, 20·7 to domestic users, 6·3 miners' coal, 12·1 to miscellaneous users and 2·0 million tons to export including bunkers.

The cost of production decreased by 2*s.* 6*d.* a ton, and the average price realized, by 1*s.* 11*d.*

The Board has increased output from the mechanized low cost mines which now produce 90 per cent of the deep mined coal. Output per manshift overall has increased from 36·6 cwt to 42·2 cwt in March 1968.

At the end of March 1968 eight remotely operated longwall face installations were at work or planned. A year's experience has yielded information on equipment and working methods, which it is expected will attain levels of productivity much in excess of the present national average.

Capital expenditure during the year amounted to £81·7 million of which £16·8 million was on major schemes and £55·4 on other colliery equipment.

Two schemes of development are notable. The redevelopment of Lynemouth Colliery in Northumberland to produce coal for a power station to serve the new aluminium smelter, and the Longannet complex in the North Scotland Area, where the coal from four units is gathered underground and supplied by conveyors to the new Longannet power station on the Firth of Fourth.

During the year there were 1,105 reportable accidents involving 130 men killed and 975 injured. The Board in conjunction with the Unions continue to carry out the national and area safety campaigns.

Loans under the Board's Housewarming plan totalled £10·5 million.

Coal wagons and loader

The Report discusses at some length, the White Paper on Fuel Policy which embraced two policies—a long term one to 1975, based on an estimated demand for coal in that year of 120 million tons and a transitional one to moderate the rundown of the coal industry to 1970–71, and the Board disagrees with regret with some features of the long term policy. It considers that a total dependence on nuclear stations for a new generation would be unsound, since in order to justify the increased capital expenditure, the plant would have to operate at the highest possible load factor, which in view of the lower summer load, it might not be possible to do. The Board also takes exception to the proposal that conventional power stations should be turned over to natural gas during the summer, as it would increase the disparity between the Coal Board's summer and winter loads involving heavy stocking costs.

## Electricity in England and Wales

*Annual Report of Electricity Council 1967–68, H.M.S.O., £1. 2s. 6d. net.*

*Annual Report of Central Electricity Generating Board, H.M.S.O., 12. 6d. net.*

The Report of the Electricity Council which records the activities of fourteen Statutory Bodies, the Electricity Council, the Central Electricity Generating Board, and twelve Area Boards, reports that the Industry sold 150,467 million kWh to 17,831,025 consumers and made a profit of £55 million. This includes a sum of £23·6 million resulting from a change in the system of accounting involving the crediting to revenue the total electricity sent out instead of that actually billed and collected during the financial year (Chapter 2, para. 17 and 18).

The capital expenditure amounted to £599 million of which 46·8 per cent was financed internally, and of which £433 million was on behalf of the Central Electricity Generating Board and £166 million the Area Boards.

The maximum output capacity of power stations at the end of the year was 41,944 MW and the maximum demand met without reduction of voltage on frequency was 35,818 MW on 10 January 1968 at 17.30 hours.

The works cost per kWh from all stations was ·6960*d.*, a reduction of ·0089*d.* on the previous year, and the average price of electricity to all consumers was 1·848*d.* The average consumption of electricity was 3,111 kWh, an increase of 167 kWh. At the end of the year employees in the Industry were 221,342, a decrease of 7,178.

The increase of sales of electricity of 8·989 million kWh over the previous year of 6·4 per cent was accounted for as follows:—8·2 per cent to domestic consumers, 10·2 to commerce, 5 per cent to combined domestic and commercial, 5·6 to industry, 5·5 to farms, 4·6 to public lighting and 7·6 per cent to traction.

Off-peak sales of electricity continue to increase rapidly and amounted to 9·056 million kWh. 525,239 storage radiators were sold during the year and some 20 per cent of central heating systems in the country are now electric. Some 8,000 MW is connected for off-peak load.

The sales of major electrical appliances by Area Boards continue to increase:—as example sales of cookers increased by 21 per cent; of washing machines by 43 and refrigeration by 27 per cent.

All the Area Boards except South Wales made a trading profit.

The transmission network of the C.E.G.B. was increased during the year by 351 circuit miles bringing the total main transmission to 17,879 miles, and 133 miles of the 275 kV system were insulated for future operation at 400 kV.

Area Boards mains were extended by 6,846 circuit units.

**Generation.**

The C.E.G.B. have 216 power stations in operation, a reduction of ten, having an output capacity of 41,944 MW. The overall thermal efficiency of generation in coal- and oil-fired plant was 27·99 %. The highest thermal efficiency achieved was 34·57 % at Ferrybridge 'C'. The load factor of the system was 52·5 %.

During the year new plant of an output capacity of 3,935 MW was installed in nine power stations, and twelve gas-turbine units were commissioned, bringing the total of such plant to 1,235 MW.

A number of 500 MW units are now in operation and research is being carried out with a view to the production of 660 MW and even larger generating sets. Hams Hall 'C' station has been fired with North Sea gas.

The total fuel consumed by power stations (other than nuclear) was 75 million tons of coal or coal equivalent, *viz.* 64·7 million tons of coal, 9·7 million tons (coal equivalent) oil and ·6 million tons of coke breeze.

By the end of the year, the number of consumers on a/c single phase supplies other than 230–250 had been reduced to 304,750. Consumers still on direct current were less than 450.

### Gas Industry of Great Britain

*Report of Gas Council for year 1967-68. H.M.S.O., 19s. 6d. net.*

The activities of the Gas Council and Area Boards were profoundly affected by the impact of supplies of natural gas from the North Sea. The Industry made a loss of £12·9 million, as the result of an increase in charges for oil as the result of the closing of the Suez Canal of £14·2 million and the effect of devaluation of £2·7 million. Four only of the twelve Area Boards made a profit.

The emphasis of the Industry's activities has changed from production to transmission and distribution. During the year 250 miles were laid for the Board's main transmission system and 976 miles of high pressure steel pipe lines were added to the distribution systems of the Area Boards. At the end of the year about 50,000 consumers were being supplied with natural gas and it is anticipated that the appliances of some 500,000 domestic consumers will be converted during the current year.

Gas sales increased by 11·9 per cent to 4,222 million therms at an average price of 22·42*d.* a therm, a decrease of ·33*d.* a therm.

The number of consumers at the end of the year was 13,216,000. The average consumption of domestic consumers increased from 183 to 211 therms.

The total gas available during the year amounted to 4,637·5 million therms, an increase of 523·1 million therms, of which 2,865 million therms were manufactured. 977 million therms being coal gas (against 1,152m.) 160 million therms water gas (256m.), 1,660 million therms oil gas (1,152.m) and 68 million therms being producer and other gases. Gas purchased from refineries totalled 328 million therms (310m.), liquid petroleum purchases were 410 million therms (488m.), coke oven gas 395 million therms (409m.), other purchases including natural gas 640 million therms. Manufacturing gas stations were reduced during the year from 214 to 192. Coal consumption fell from 16 to 13·6 million tons.

During the year 1,500 m.c.f.d. of new capacity was commissioned including 57 units of high pressure continuous oil gasification plant with a combined capacity of 1,218 m.c.f.d.

The highest increase in gas sales was in the domestic market, mainly accounted for by the expanding use of gas for central and space heating. The number of central heating systems installed during the year by Area Boards and independent contractors reached 283,000 compared with 231,000 in the previous year.

The advent of natural gas has led to a redirection of research from manufacturer to gas storage, transmission and distribution. Studies have continued in the storage of gas in underground units and in geological formations.

During the year the Industry produced 5·8 million tons of coke and 1·6 million tons of breeze, compared with 6·9 and 1·8 million tons respectively during the previous year. Of this ·6 million tons of coke and ·4 million tons of breeze were used in the Industry. Coal tar output fell to 965,000 tons from 1,163,500 tons in 1966–67. Crude benzol amounted to 15,018,000 gallons in comparison with 17,849,000 gallons during the previous year.

The capital invested during the year amounted to £282 million bringing the total capital investment in the Industry to £1,166 million.

The employees at the end of the year amounted to 122,800 in comparison with 124,300 at the end of the previous year.

### N.I.F.E.S. Report and Accounts for the year ended 31 March 1968.

Despite a slight reduction in the engineering and ancillary staff and a 4% fall off in work load in the terms of man-days, N.I.F.E.S. report a growth in earnings in the year under consideration; this in spite of the fact that part of N.I.F.E.S.'

important work is in the form of a public service which can never be expected to become self supporting.

The report goes on to show that improvements in the utilization of all forms of energy for heating and process requirements are helping to make British industry more competitive in both home and overseas markets. The benefits that accrue from increased efficiency also contribute some relief to the country's balance of payment problems in several ways, first and foremost of which, is the effect created by a reduction in imports of energy. The report indicates how the work of N.I.F.E.S. has helped to achieve this.

There follows a survey of the services which N.I.F.E.S. provides which, in the year under review, accounted for 35,311 man-days.

### Index to Air Pollution Research, 1968 Edition, by Patricia A Burd.

*Published by the Centre for Air Environment Studies of the Pennsylvania State University.*

This is the fourth annual edition of this Index which constitutes a guide to active industrial and non-profit sponsored research projects in the U.S.A. and elsewhere. This edition includes the project title, the name of the investigator and recent publications and papers resulting from the research. Approximately 800 currently active investigations are indexed by the Keyword-in-Context method.

Copies of the Index may be obtained from the Information Office, Centre for Air Environment, University Park, Pennsylvania 16802, at 2 dollars per copy.

### The Pollution Reader, compiled by Anthony de Vos, Norman Pearson, P. L. Silveston, and W. R. Drynan.

*Published by Harvest House of Montreal, 264 pages, paper 3·5 Canadian dollars; cloth 5·95 Canadian dollars; illustrated.*

This book is based on the papers presented and the subsequent proceedings of the Canadian National Conference on Pollution and our Environment held in Montreal in the autumn of 1966. It presents, in a handy and readable form, the essence of the pollution problem in Canada and the measures for its control as reflected in the work of the Conference.

The book comprises eight main sections together with a glossary of technical terms, a list of contributors and a brief bibliography. The main sections deal with the Ecological Perspective, the Regional Approach, Food, Soil, Water, Air, Abatement and Control, and although the book is mainly directed towards the general public, there is one section entitled "Mainly for Practitioners".

The section on Air has comprehensive chapters on the Effects of Air Contamination on Health and the Nature and Sources of Air Pollution. Unfortunately, the section of the book on Abatement and Control deals exclusively with measures for the abatement of pollution in water, although the "Mainly for Practitioners Section" discusses briefly the detection and measurement of pollution in the air.

### "Die Analyse der Luft und ihrer Verunreinigungen in der freien Atmosphäre und am Arbeitsplatz (The Analysis of the Air and its Pollutants in the Open Atmosphere and at the Place of Work), by Dr. W. Leithe.

The author is chief analyst in the central laboratory of the Oesterreichische Stickstoffwerke A.G. at Linz/Danube, Austria, and a professor at Vienna

University. He gives a well-arranged survey of the different methods for measuring gaseous, liquid and solid components in the air as a general environmental factor and at the place of work. This manual gives detailed information for the exercise of air analysis. Basic knowledge in analytical chemistry is presupposed. More than 300 publications have been evaluated, most of them of German, American or English origin. Special reference is made to the respective directives of the VDI-Kommission Reinhaltung der Luft. An appendix moreover comprises a tabulated view of the actual MAK-values (permissible concentrations at the work-place) in the Federal Republic of Germany.

The reader will find six sections:

*1 General:* "Clean air" and "air pollution", "emissions" and "immissions", historical aspects, clean air legislation and public measures, literature, origin and prevention of air pollution, meteorological influences on the dispersion of waste gases, effects on man and vegetation, MIK-values (permissible immission concentrations), etc.

This introductory chapter is to give the analytical chemist a synopsis of the various problems in the field of clean air maintenance.

*2 Methodical questions:* Selectivity of measurement, necessary accuracy, frequency of analyses, need of time, costs, selection of the adequate method, sampling, handling and concentrating of samples, use of impingers, mobile laboratories, etc.

*3 Experiments with gas mixtures:* Preparation (static and dynamic methods), application of tracers.

*4 Analytical methods:* Photometric procedures, collecting permanent methods, gas-detection apparatus (test tubes), continuously operating (automatic) instruments based on light absorption, colorimetry, electric conductivity, etc., gas-chromatographic analysis and employment of detectors, mass spectrometry, air analysis by the aid of the olfactory sense.

*5 Measuring the special substances:* Dust (gravimetric methods, indirect measurements, Bacharach scale, Ringelmann scale, particle counting, measuring of dust deposit), radioactive substances, rare gases, oxygen, ozone, atmospheric moisture, hydrogen sulphide, sulphur dioxide, sulphuric acid and sulphur trioxide, ammonia, nitrogen oxides, carbon monoxide and carbon dioxide, fluorine compounds, chlorine, hydrogen chloride, bromine vapours, lead, etc.

*6 Measuring of air-polluting organic compounds:* Prussic acid, carbon disulphide, aldehydes, acetone, chlorinated aliphatic hydrocarbons, esters of lower fatty acids, benzene, toluene and xylenes, styrence, phenol, aniline, benzo($\propto$)pyrene and other polycyclic aromatic hydrocarbons.

Dr. Leithe's outstanding book gives evidence of the fact that the necessity of air pollution control has stimulated the development of chemical and physical analytical methods and measuring instruments.

It is edited by Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart, Postfach (box) 40. Price: DM 58.–. 288 pages, 58 pictures.

*H. W. Schneider*

## Routine Surveillance for Radionuclides in Air and Water

*Geneva, World Health Organization, 1968, 64 pages. H.M.S.O. 16s. net.*

Despite the international nuclear test ban treaty of 1963, environmental radiation still presents a public health problem. Nuclear reactors are being built in ever-increasing numbers to supply power to the world. New nuclear research programmes are being initiated in many countries, and radionuclides are being applied more and more frequently in activities such as medicine, agriculture, technology, and research.

In the years ahead these developments will be supplemented by other useful applications, such as auxiliary nuclear power units, naval and aerospace propulsion systems, and nuclear plants for desalting seawater. As a result, more and more radioactive waste will have to be disposed of. A certain proportion of this waste, particularly the large volumes of low-level material, will be discharged into the environment.

For some years the World Health Organization has been advising Member States on measures to be adopted to ensure the safe use of radioactive materials and to minimize exposure to ionizing radiations. This publication, which is the outcome of a technical meeting organized by WHO and held in Geneva from 24 to 30 October 1967, is designed to provide assistance to countries with developing nuclear energy programmes and to those in which the principal activities involving radioactive materials are the applications of radionuclides in medicine, research, and industry.

# INDUSTRIAL and COMMERCIAL NEWS

by Michael Morgan

## INCINERATION

Hodgkinson Bennis Limited are pleased to announce the introduction of the "Cadet" a new low priced incinerator intended primarily for use in education and other establishments where the refuse consists of paper, packing materials and other light, dry wastes.

It is a robustly constructed unit, cased in heavy gauge mild steel and fully lined with refractory. The lining, which is built up from high grade pre-cast refractory slabs, ensures that the casing temperature is kept low enough to prevent distortion of the metal and burning of the protective paint. Consequently, the life of the "Cadet" is considerably greater than that normally expected with this type of incinerator.

With a charging capacity of 5 to 6 cubic feet the "Cadet" will handle approximately 30lb of loose, dry refuse per hour, in compliance with the requirements of the Clean Air Act 1956. No special foundations are required and the unit, which has a total weight of 10¼ cwt, can be installed and working within one hour of delivery.

### New Middleton Incinerator

The Rt. Hon. Anthony Greenwood, M.P., Minister of Housing and Local Government recently opened the new £300,000 refuse incinerator, built by Motherwell Bridge Tacol Ltd. for the Borough of Middleton (Lancashire).

Welcoming the guests, Mr. A. R. Miller, Chairman of the Motherwell Bridge group of companies, pointed out that Middleton had been the first municipality in Britain to order this new type of incinerator, manufactured in this country by Motherwell Bridge Tacol Ltd. under licence from Vereinigte Kesselwerke A.G., Düsseldorf. Glasgow Corporation and the Greater London Council had, he said, since followed the lead of Middleton by ordering incinerators valued at £1·7 m. and £1 m. respectively.

Mr. Miller formally handed over the plant to the Mayor of Middleton, Councillor Mrs. Grace M. Pugh, J.P., who in turn invited the Minister to declare the plant officially open by unveiling a commemorative plaque.

This incinerator, ordered in September, 1966 by the Borough of Middleton, is designed to burn municipal refuse, including a small proportion of bulk and trade waste, at the rate of eight tons per hour.

A weighbridge of 30 tons capacity is provided to allow all incoming and outgoing materials to be weighed. After passing over the weighbridge, the refuse vehicles proceed to the incinerator's reception hopper, where there are six discharge points, each consisting of a bay approximately 25′ in length and with a door at each end. The driver manoeuvres the vehicle into position in front of a given bay, selected and indicated by a light above the appropriate door by the operator of the crane which transfers the refuse from the reception hopper to the feed hopper of the incinerator.

When the vehicle is fully inside the bay, the driver stops alongside a second switch, which he operates to close the front door and open the rear door leading to the reception hopper; he then reverses to the tipping beam. As the rear door opens, a light above the door is illuminated to warn the crane operator that the rear portion of the vehicle is about to protrude into the reception hopper. When the vehicle is in position, the refuse is discharged into the reception hopper and the empty vehicle then leaves the bay, the driver reversing the procedure described above.

The reception hopper is designed to accommodate 800 cu. yds. of refuse, which allows the plant to operate two or three shifts per day, with refuse collection and delivery taking place only during one shift. The end bay and end section of the reception hopper will normally be reserved for bulky refuse, which can be broken up by the grab to a size suitable for feeding to the incinerator.

The crane, which is of the four-rope type, has hoisting and longtitudinal movement, but no cross travel. The grab—of the clam shell type, with long tynes—has a heaped capacity of 110 cu. ft. and a flush capacity of 88 cu. ft.

The grab discharges refuse into the feed hopper of the incinerator, which has a capacity of approximately 50 cu. yds. and is designed to feed the refuse continuously at a controlled rate into the combustion compartment. For this purpose a hydraulically-operated ram, adjustable for speed over a wide range, is provided at the bottom of the feed hopper which also has a gate, which is closed when the level of refuse in the feed hopper is low, in order to provide an air seal. The air seal is otherwise provided by the quantity of refuse in the feed hopper. A damper is also provided to isolate the feed hopper from the incinerator when necessary.

The incinerator is of the roller-drum type, operating to what is known as the "Düsseldorf System". This unique incinerator is of the continuous-operating, moving-grate type, specifically designed for burning refuse. The grate consists of 6 rollers, of 5 ft. diameter, stepped at an angle of 30°, the rollers being of optimum arrangement to produce the necessary turbulence of the refuse with maximum burning. To avoid excess metal temperatures, the side casings alongside the rollers and also the two roller support beams are both air cooled by a small, induced-draught fan which draws air through a boxed section of the beam and through specially constructed air-cooling boxes fitted behind the side wall castings.

The forced draught air for combustion is supplied from a forward-curved centrifugal fan which also serves the purpose of controlling the dust at the feed hopper by ducting air by a hood to the suction side of the fan.

The £300,000 VKW roller-grate incinerator, built by Motherwell Bridge Tacol Ltd. for the Borough of Middleton

The exhaust gases from the incinerator are conveyed to the 150 ft. brick chimney by means of two aerofoil-bladed, induced-draught fans operating in tandem. In order to bring these gases down to an acceptable temperature for the fans to handle, they are cooled by means of air attemperation, whereby a forced-draught fan injects cold air into the gas stream shortly after it leaves the combustion zone. This fan is of a similar type to the combustion air fan and once again serves a dual purpose by controlling the airborne dust at the reception hopper. This is done by connecting the suction side of the fan to a manifold running along the back of the hopper, which is fitted with adjustable louvres opposite each vehicle bay.

Flue gas is cleaned by a multi-cell mechanical collector, so designed as to ensure that the dust emission of gases to atmosphere does not exceed 0·2 grains per normal cu. ft.

There is a degree of waste heat recovery from the flue gases (used for heating the incinerator and ancillary buildings) by means of a gilled tube economizer situated in the flue duct, between the fan discharge and the chimney. This economizer operates at a temperature of 700° F with a rating of 1·3 million BTUs per hour to heat the water circulating to the various radiators through an indirect heating system. A by-pass duct is incorporated to divert the gases from the heat exchanger when full heat is not required.

The burnt-out residue from the incinerator is quenched in a submerged belt conveyor before being taken by means of elevating conveyors to a storage bunker of 20 tons capacity. The grits collected in the storage hopper below the collector are also incorporated in the ash disposal system by being sluiced directly into the submerged belt conveyor.

Separation of ferrous metals and tins from the ash is carried out by means of an overband magnetic separator located on the elevating section of the conveyor which takes the ash to the storage hopper. The metal baler is positioned at ground level, close to the discharge chute from the magnetic separator.

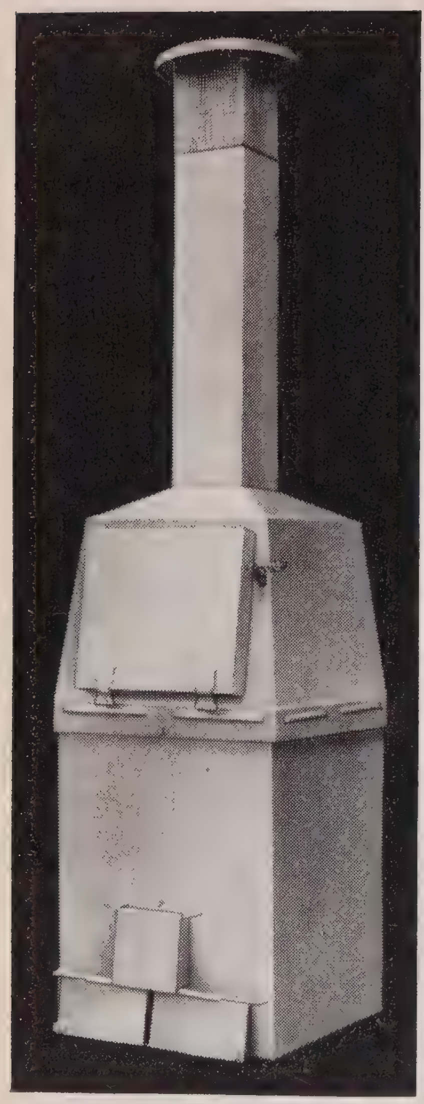
The plant incorporates full automatic control of fan dampers to maintain constant gas temperatures and draught conditions inside the furnace. All incinerator controls are grouped together on a desk type console housed in a separate control cabin. The only exception to this is the control for the speed of the rollers, which is contained in a separate panel mounted half-way up the side of the incinerator walkway, between rollers 3 and 4. By this means, combustion conditions inside the incinerator can easily be adjusted in conjunction with peepholes located above each roller.

It is envisaged that the plant can be operated by a minimum staff of three.

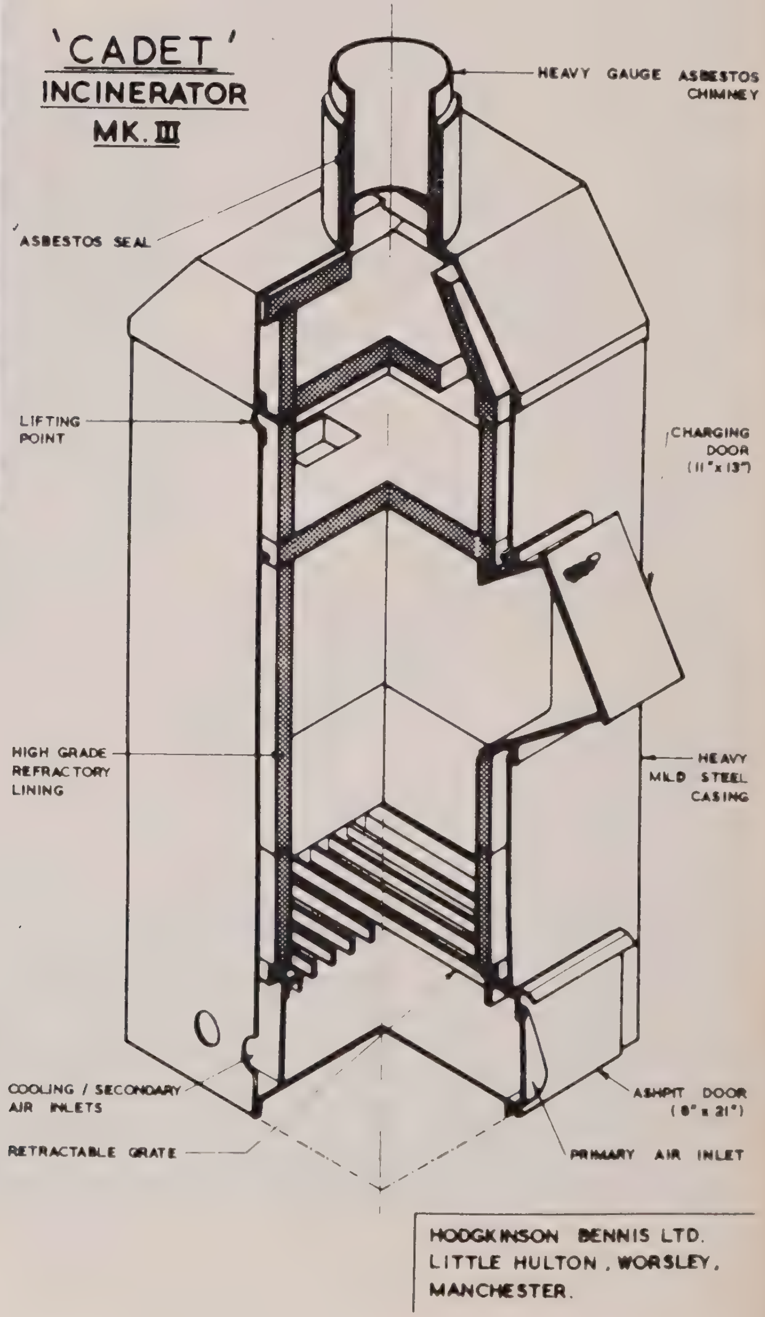
## District Heating by Incineration in Nottingham

The Corporation of Nottingham is planning the construction of one of Europe's largest district heating schemes as an integral part of the major scheme for the re-development of the centre of the City covering three square miles. This is the largest scheme for urban renewal outside London and will include the Civic Centre, shops, offices and factories and 9,000 new homes.

A unique feature of this scheme is that 60% of the heat, equal to that produced by 40,000 tons of coal annually, will be supplied from an incineration plant burning industrial and domestic refuse. The remaining heat will be supplied from a coal burning plant.



The 5 cu. ft. Harvey Industrial Incinerator, the smallest of three models available. This model will consume a full load of combustible material—smoke free—in only 10 minutes. All three models, 5 10 and 20 cu. ft. capacity take up a very small amount of floor space, are free standing and can be sited virtually anywhere and moved as required



The scheme has been designed by Associated Heat Services Ltd., a company established by the National Coal Board, Solar Industries Ltd., and the French specialists Compagnie Générale de Chauffe—who are European leaders in district heating. Associated Heat Services Ltd., will operate the scheme for Nottingham, thus relieving the city of the day to day responsibilities entailed in its running. The burning of refuse will make a substantial reduction in heating costs to the consumer. Exhaustive costing exercises indicate that heating and domestic hot water will be supplied at a cost about one-third lower than the consumer would normally expect to pay. A network of distribution mains will serve the various areas, and heat exchange warm air appliances inside the homes will supply central heating in the form of warm air.

A further important benefit is that the city which would otherwise have to find space to tip from 100,000 to 170,000 tons of rubbish each year, will now be able to release land for building. There will be further savings in the disposal of the refuse. Tenants will enjoy heat and hot water supplied on tap, in the same way as any other utility service, and at low costs, which district heating brings.

The district heating plant will begin to produce usable heat in 1970, but it will not be fully operational over the whole area until 1980 by which time it will be eight times as large as the district heating scheme at Billingham-on-Tees, at present the largest in the country.

By 1970 the incineration/heating plant will have a total heat capacity of 4 million Btu/h and by 1980 this will rise to 440 million Btu/h. In terms of total fuel consumption this will entail the burning of 170,000 tons of refuse (the equivalent of 40,000 tons of coal) per annum, and of 20,000 tons of coal. In total this meets the the heating needs of a town of 40,000 people with all contingent urban services. Annual consumer demand is estimated to reach 10 million therms by 1980.

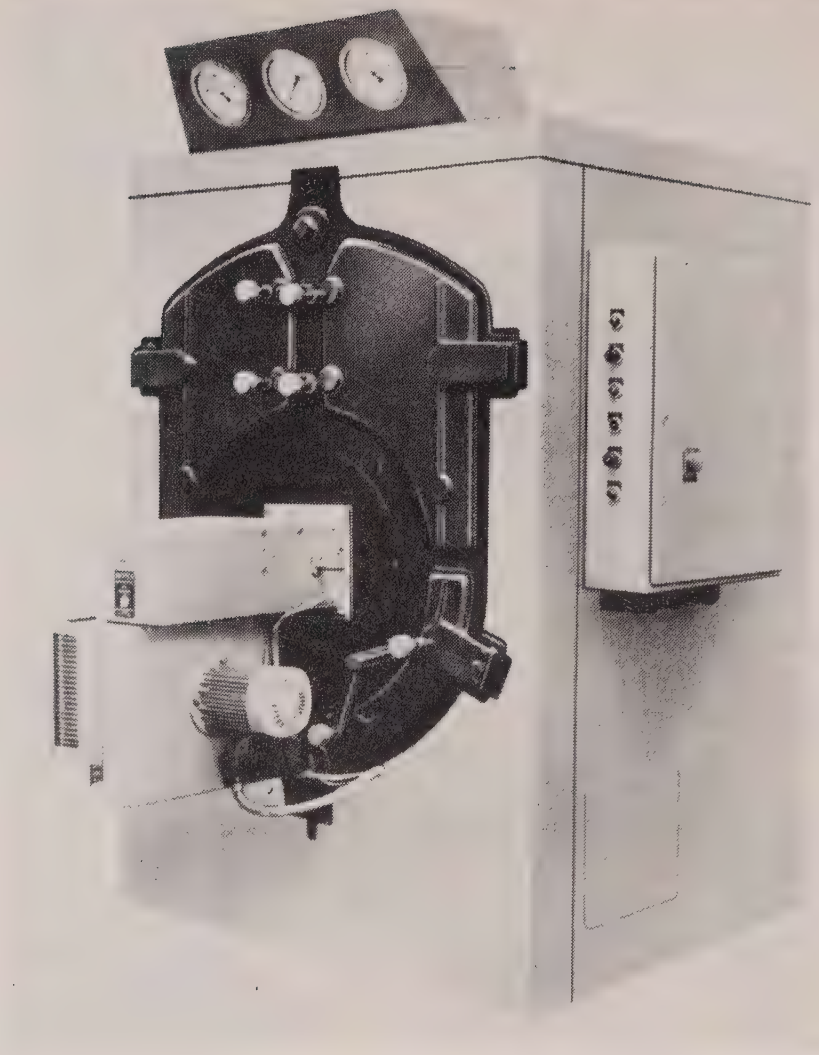
## BOILERS

Recently the Beeston Boiler Company Limited announced one of their biggest advances to be made in cast iron sectional boiler design for many years past and in preparation for the large scale production of this new boiler, a new fully automated foundry is to be built at Beeston costing some £650,000, as was announced by the Chairman of the company Mr. J. K. Smith at the recent annual general meeting.

The new boiler which works under positive pressure conditions in the combustion chamber was shown at the Clean Air Exhibition held at Harrogate from 22 to 25 October.

Known as the Beeston Robin Hood "Series 5" boilers these units are the result of three years' development work and are a radical departure from previous Cast Iron Sectional boiler designs which due to difficulty of ensuring a gas seal between individual sections have never been able to take advantage of the increased heat transfer which can result from the operation under positive pressure conditions in the combustion chamber.

This problem has been overcome in the "Series 5" by the development of a patent intersection joint which not only ensures a high pressure water seal but also an efficient gas seal between the sections so that the boiler can be operated under these conditions and designed to take full advantage of the resultant high heat transfers in the primary combustion zone.



The Beeston Boiler

In addition the gas velocities in the secondary zones have been increased again resulting in high heat transfer rates so that output for output the "Series 5" boilers only occupy one third of the space required by the conventional cast iron sectional boilers.

The flue gas travel takes the form of a conventional three-pass system. The first pass consists of the combustion chamber, the gas returning to the front of the boiler through annular passages surrounding the combustion chamber and travelling to the outlet at the rear of the boiler through the passages arranged above the combustion chamber.

As the boiler is operated on a fully forced draught combustion system, no chimney draught is required to overcome boiler resistances and is only required to be designed to clear the flue gases and meet any statutory regulations in respect of height. This, of course, results in a smaller and less expensive chimney than that required for existing types of cast iron sectional boilers unless these are provided with an induced draught system.

The high heat transfers designed into the unit require that the water flow within the boiler should be positive and controlled and for this reason a pump is provided as an integral part of the unit to provide this circulation. This pump is located in a by-pass loop between the main flow and return connections. It cannot, of course, be used to provide any circulating head as far as the main heating circuits from the boiler are concerned.

The use of a separate pumped circuit for the boiler itself will allow the operation of the boiler with an extremely small differential between its own flow and return connections and thereby lessen the temperature differential stresses.

The high gas velocities used in the secondary passes mean that the boiler's largely self-cleaning under normal operating conditions but it is nevertheless provided with cleaning doors at the back and the front which are readily accessible and the passes can be easily rodded through from either the back or the front.

# AIR POLLUTION CONTROL EQUIPMENT

## The A.B.K. Electrical Company Precipitator

For many years now electro-static precipitators have been available fitted into highly sophisticated air conditioning plants for use in hospitals, laboratories, etc. Three portable units are now available designed for use in private homes, restaurants, bars, in fact any situation where purified air is required.

The three models are the ABK 130, 258, and 320, each offering an airflow of a corresponding number of cubic feet per minute. The Model 258 absorbs particles down to ·00008″ and from 99·2% to 99·5% smoke, fog and soot when the size of the drops or particles are less than $\frac{1}{2}$ $\mu$m. The smoke tests have been made in paraffin mist, cigarette smoke and soot from burning paraffin. The ABK 258 absorbs all dust up to 92%, and through its high efficiency 99·2% bacteria and pollen from the atmosphere. The bacteria trapped in the filter are *killed.* This machine will thus effectively sterilize the air of a room of medium size with an optimum of six complete changes of air per hour. A 1 or 2 kW heater has been fitted to offset the reduction of temperature, and therefore can be used as a heater as well as an air conditioning plant.

The above perfomance is achieved by using a light alloy filter unit which acts as an ionizer and dust extractor, and the 7,500 volt feed to this filter unit is provided by a valve rectifier and transformer. The fascia of the unit is fitted with a pilot lamp which glows brightly to indicate that the plates need cleaning, which is a very simple operation.

## Mikro-Airetrons Now Control Air Pollution Problem

Mikropul Ltd., Shoeburyness, have added wet-type gas scrubbers to their existing range of dust collectors. They include the Mikro-Airetron Cyclonic Gas Scrubbers and the Venturi Gas Scrubbers which handle with maximum efficiency, solid or liquid, micron and sub-micron particles. The same high rate of efficiency applies to the Packed Tower Gas Scrubber, designed for the removal of corrosive fumes and noxious gases.

Mikro-Airetron Gas Scrubbers are of well established design, with up-to-date modifications to ensure higher removal efficiency, easy recovery, minimum maintenance and low capital cost.

The standard ranges for gas cleaning are from 500–100,000 c.f.m., with construction materials to suit the application.

Other Mikropul products include pulverizers, reverse jet dust collectors and rotary discharge valves.

## Central Heating In One Day

Solid fuel central heating installed in the house in one day is now available almost all over the country. A nation-wide network of skilled installers to carry out this new-look central heating came into operation in October last.

Under the auspices of Radiation Parkray Limited, manufacturers of Parkray solid fuel central heating appliances, over 50 highly-qualified installers now operate this new scheme.

Considerable rationalization of labour and equipment has already reduced the time and inconvenience of installing central heating units, but teamwork, streamlined advance planning, the most modern tools and equipment combined with first-class workmanship make the one day installation a reality.

The basic routine of one-day central heating is as follows: a team of four or five men from the installers arrive fully equipped at 8 a.m. on the morning of installation day, at the previously surveyed house. Each man is already briefed on his work for the day, and by careful co-ordination of the tasks by the foreman, and split-second planning, the Parkray is installed and the central heating system in operation by the same evening.

The minimum of inconvenience to the customer is the major aim of these one-day installers. Teams are equipped with vacuum cleaners, and other equipment to ensure that the entire house is left immaculately clean and tidy. To make I-day enjoyable for the householder, in fact, he and the family (or much more likely, she and the family) have lunch out at a local restaurant at the expense of the installer on the day. There is also a guarantee with the installation—if it is not completed within the one day, the householder receives a £10 cash compensation,

The speed and accuracy of the one-day job means that installers are able to offer the complete installation at a highly competitive price—£235, with £1 1*s*. 6*d*. weekly repayments over five years under the National Coal Board's House-warming Scheme.

For this sum the householder gets a Parkray solid fuel room heater with high-output back boiler, a circulating pump, a new hot water tank, five radiators, the pipes and the installation itself.

One-day central heating has been carried out previously with great success by isolated Parkray installers, but now Radiation Parkray Limited have brought these installers together, encouraged many more to offer this service and presented the proposition on a national basis.

## New Thermal Storage Process in Paint Production

"The development of electric thermal storage equipment for industrial process heating is an example of what the electricity supply industry is doing to ensure that its customers can get the fullest benefit from electrical techniques and equipment", said Mr. Percy Sydney, deputy chairman of the East Midlands Electricity Board recently at Derby. He was speaking at the works of Joseph Mason & Co. Ltd., where the first example of off-peak heating by the heat exchanger method is being used for process work in the paint industry. He stated that this installation has already demonstrated economic advantages over plants fired by other fuels. It is very easily and accurately controlled, and usually odourless in operation.

This development has come about as the direct result of work carried out by the Electricity Council's Research Centre at Capenhurst in Cheshire. These comprehensive laboratories were set up just a few years ago by the electricity supply industry to reinforce the work of the Electricity Boards and to back them up with research and development facilities, both short and long term, looking into the broad spectrum of electrical utilization. One of its main activities is to get new ideas into service to the benefit of the customer.

Off-peak electric thermal storage has proved itself beyond doubt in the domestic field. In little more than five years well over 2½ million storage radiators have been put into service in British homes and something over a million families are now enjoying the comforts of off-peak electric central heating.

Why shouldn't industry use off-peak heating? The resin plant in Joseph Mason's works shows how it can be done. This type of thermal storage system is readily adaptable to all manner of other applications wherever an easily controllable flow of heated fluid—either liquid or gaseous—is required. Undoubtedly, it is the forerunner of many other applications in the chemical, plastics and allied industries.

It was four years ago that the Electricity Council first considered developing thermal storage systems for medium temperature process heating applications—that is up to 500°C. It was thought that a particular consumer group to which this was readily applicable was the paint and varnish manufacturers. Synthetic resins, the base of most modern paints, are prepared by heating particular chemical formulations in stainless steel cylindrical containers, known as "kettles", in order to polymerize them. These containers are designed to treat between 100 and 500 gallons of resin requiring power inputs within the range 50–300 kW and temperatures up to about 300°C. The heat requirement for such a process can obviously be supplied quite satisfactorily by an electric thermal storage source since it falls well within the medium temperature range.

At the time the first experimental plant was decided upon, one of the objectives was to examine on a practical scale the use of a fused salt as a heat storage medium. This arose because of the investigations then being made on the use of the latent heat of fusion of caustic soda and the proposition that it should be employed in domestic storage radiators. It was felt that, because of the possible hazards of liquid salt at temperatures up to 750°C, the best place to test such a material was in a chemical works, where the necessary safety precautions were taken as a matter of course. But this part of the experiment disclosed that serious disadvantages could occur if a fused salt were to be used as a storage medium and these would more than outweigh any advantages.

A thermal storage scheme was therefore discussed with Joseph Mason Paints who were very interested. It was demonstrated to them that the incentive to the consumer in using such a system is twofold. First, because the storage unit is designed to charge fully in eight hours only, he will be buying his electricity at the lowest price. Second, because the unit is only used during the night hours he will not have to pay Maximum Demand charges. In consequence, the energy costs of this first production unit are competitive with those of an oil-fired installation and considerably lower than for a gas-fired system.

The design of the overall installation, including the chemical plant, was carried out by Electricity Council staff, and the original unit using the salt storage medium was manufactured by Aiton & Co. Ltd., of Derby. When the work on the salt store had been completed and results obtained, this part of the equipment was removed. A totally new storage heater was then designed and manufactured at the Electricity Council Research Centre at Capenhurst and considerable modifications made to the remainder of the heating system. The present installation has been working satisfactorily on production since last December.

# CHIMNEYS

## Sixth Thermotank Dribore Chimney for New £3 Million Paper Plant

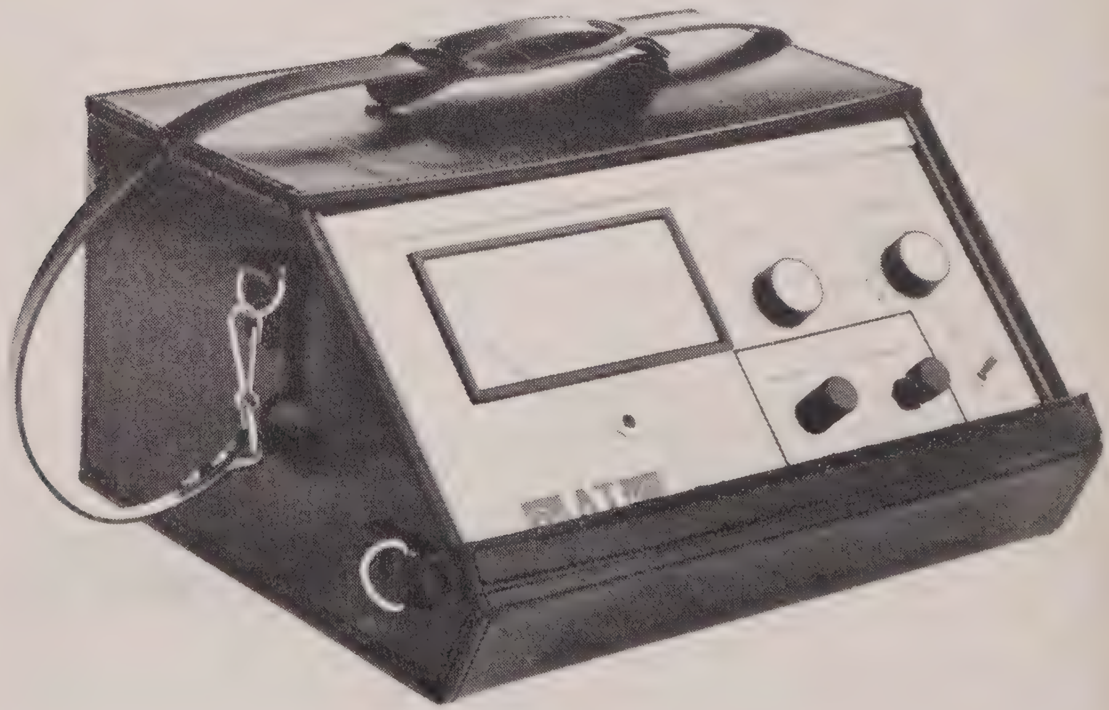
Three further Dribore chimneys have been ordered for installation at the new £3 million plant of the Bowater Scott Corporation Limited as part of their expansion programme at Barrow-in-Furness. This follows a similar order received last year.

The chimneys will be supplied by the Products Division of Thermotank Limited, Chapelhall Industrial Estate, Airdrie, Lanarkshire, who will undertake design, manufacture and installation.

The three chimneys, which are formed from mild steel, are of a double-skin, self-supporting construction, 37 ft. 10 in. high, with an internal diameter of 26½ in. They will be used in direct conjunction with Steam Raising Plant which is designed for Process Drying and Factory Heating.

In the Thermotank Dribore chimney, the inner skin acts as the flue, while the outer skin is the load bearing element. Between these two sections is a packing of mineral insulation designed to maintain flue-gas temperatures above the acid dew-point level. This reduces smut emission and acid corrosion.

# INSTRUMENTS



The Portable Oxygen Meter Model 02T

## New Rapid Response Portable Oxygen Meter Model 02T

Analytical Instruments Limited announce a new portable oxygen meter for measurement of 0–3 p.p.m. oxygen in nitrogen, argon or any gas usable as carrier in the electron capture detector fitted in the instrument. The sensitivity is better than 0·1 p.p.m. and a range change allows use up to concentrations of 60 p.p.m. The instrument has a response time of five seconds and is fitted with a reference zero system. Also provided is a built-in check calibration device which operates by introducing a metered volume of air into the instrument.

## A New Cost Data Chart By W. C. Holmes & Co. Ltd.

During the past year or so we have frequently been asked by project and design engineers for comparative performance and cost data on various types of dust collection and control plant.

Whilst this information is contained in a number of technical brochures, it was felt that these should be supplemented by a chart which presented all the relevant information in a concise and simple form. As a result, Messrs Holmes have recently published a comprehensive performance and cost data chart which deals with all Holmes products including dust collection and control plant, controlled atmosphere generators, solids processing equipment, chemical engineering equipment and Roots type blowers, vacuum pumps and meters.

Each of these charts will have an associated set of product cards, the purpose of which is to explain in very simple terms how a particular piece of equipment works and the difference between it and other types of plant doing a similar job. The first four cards in the series have already been printed—cards dealing with other products are to be published during the coming weeks.

If any readers would like to have copies of the performance and cost data chart and the associated product cards they should contact W. C. Holmes & Co. Ltd., Huddersfield.

# COMPANY NEWS

Ames Crosta Mills & Co. Ltd., a member of the Woodall-Duckham group of companies, have acquired the business, goodwill and principal assets of Pionex Limited of Hyde, Cheshire.

Pionex have established a first-class reputation as mechanical contractors engaged in the repair and servicing of equipment in the power, steel and chemical industries with particular emphasis on electro-precipitation. Their expertise in the abatement of air pollution will be complementary to that of ACM in the field of water pollution control.

Management and operating personnel of Pionex, with Mr. Kenneth Jones as General Manager, will constitute a new Pionex Division of Ames Crosta Mills and, from Heywood, Lancashire, will continue and expand their services to industry.

## Parkinson Cowan Group of Companies

G.W.B. Boilers Limited have become members of the Parkinson Cowan Group of Companies. As a result of this, the electrode boiler interests of Parkinson Cowan Heating Limited which include the Bastien and Allen and the Autolec high and low voltage electrode boilers, have been amalgamated with G.W.B. Boilers interest in oil, gas and coal fired boilers.

G.W.B. Boilers Limited will remain fully resident at the Dudley Factory and from there, operate the new wider business, and we are confident that as a result of the integration of both internal services and outside servicing, we shall be able to offer the customers of both companies better facilities than ever before. G.W.B. Boilers thus will become unique in so much that the new unit will be able to offer both steam and hot water boilers fired by coal, waste fuels, gas, oil or electricity and in many cases, combinations of these fuels.

## £10,000 Order

Newton Collins Limited, the Birmingham experts in dust collection and fume removal, have just won a £10,000 contract to supply dust extraction equipment to Heenan and Froude Limited, Worcester. It is to be used in refuse disposal plants for the City of York and the Borough of Pudsey.

# APPOINTMENTS

## Export Manager for Carron

From his position as Sales Director of Carron Becander Limited (the engineering member company in the Carron Group), Mr. Ian B. Gibson has been appointed Export Manager for the products of the whole Carron Group of Companies.

In his new post, Mr. Gibson will be responsible for the overseas marketing and selling of such products as cast iron, pressed steel and 'Perspex' baths; bathroom equipment; stainless steel sinks; roomheaters; castings for the building trade; commercial catering equipment and hydrostatic transmissions.

## New Marketing Manager for Crane Heating Division

Crane Limited announce the appointment of Mr. R. M. Bishop, M.Inst.M.S.H. as the Marketing Manager of the Heating Division.

After spending 10 years as a representative for Tayco Boilers Limited he entered sales and marketing management with Glow-worm Limited, for a number of years and then senior sales management with International Janitor Limited.

Mr. Bishop will be responsible to the Divisional Manager for the Marketing and Sales Policies of the Division.

## National Coal Board Appointments

Mr. F. B. Harrison, Chief Accountant, North Derbyshire Area, National Coal Board, has been appointed Finance Director of the Board's Coal Products Division with effect from 1 November, 1968.

Mr. Harrison succeeds Mr. G. E. Le Fevre who has resigned from the Board's service to take up an appointment as Financial Director of the Ruberoid Company Limited.

Mr. P. D. Johnstone is returning early in November to the post of Investment Manager, National Coal Board Superannuation Schemes, after spending nearly two years with the 117 Old Broad Street Group. He succeeds Mr. R. V. Edward, who was Finance Director of the Board's former East Midlands Division.

Mr. L. MacNaughton, who has been Marketing Director (Chemicals) of the National Coal Board's Coal Products Division since April, 1968, has been appointed Managing Director of the Thomas Ness Group, Coal Products Division.

All the Division's non-solid fuel activities—which include the production and marketing of tar and chemical products, proprietary products such as 'Synthaprufe', and new products like 'Hyload'—will in future be the responsibility of the Thomas Ness Group.

Mr. MacNaughton's appointment dates from August 1968.

# Air Pollution Abstracts

## Abstracts of Papers Presented at N.S.C.A. Annual Conference, Harrogate 1968

**1086. Presidential Address.** Charrington, Sir John. After referring to some important points in Mr. R. Maxwell's new Clean Air Bill, the paper emphasizes the importance of taking measures against pollution from road vehicles. This is now feasible technically, but a position of impasse seems to have been reached: the motor industry waiting for legislation from the Ministry of Transport and the Ministry waiting for evidence from a large protesting body of opinion existing in this country. Whatever the health aspects might be, pollution from traffic is an invasion of our amenity which should be protected. The future of the National Society for Clean Air lies in taking the lead by working with similar bodies who are concerned with the preservation of our amenities and our environment.

**1087. Clean Air and Electricity's Future Contribution.** Lingard, P. A. The British electricity supply industry employs very considerable expenditure of capital and scientific resources to bring under control the emission of pollutants which arise from the burning of fossil fuels.

The three pollutants with which the industry is principally concerned are dust, smoke and sulphur dioxide. Carbonaceous smoke is virtually eliminated by very strict control of combustion conditions; dust emission is controlled by high efficiency arrestors; and in the case of sulphur dioxide, high level dispersion by very tall chimneys has emerged as a wholly effective method of controlling the concentration at ground level.

In the current decade, it is estimated that the C.E.G.B. expenditure on clean air will total £124 million, and by 1970 will have reached about £17 million per annum.

Nuclear power stations cause no air pollution and recent relaxation will enable them to be sited much nearer to built-up areas.

At the point of use, electricity is employed without combustion in the ordinary sense, and thus without the emission of pollutants.

The adoption of heat reclaim and space-conditioning techniques can put to good use heat incidentally gained, and buildings designed and planned on these principles will be coming into use within the not too distant future. The electric car, silent and fumeless, is now at a critical stage of development. To make a start on the necessary process of clearing our streets and highways of the pollution emitted by car exhausts would be one of the major positive contributions of all time to the cause of clean air.

**1088. Clean Air and Future Fuel Usage (Gas).** Hetherington, A. F. The paper describes the clean air attributes of natural gas in its production, distribution, storage and end-use. Its increased use in place of coal and oil will make a major contribution to clean air. Comment is made upon the gas industry's marketing policy in this regard.

It is suggested that the next objective of the Society should be the reduction of sulphur pollution in city centres. This is a more difficult project to handle than was the elimination of smoke, in that the sulphur dioxide and other sulphur pollutants are invisible.

Figures are given to indicate the size of the sulphur problem and comment is made on attitudes to it of a number of other countries. The suggestion is made that a limit should be imposed on the sulphur content of fuels used in heavily-populated areas.

The point is made that the rapid expansion expected in the use of natural gas for commercial central heating will be an important factor in reducing sulphur in city centres.

**1089. Clean Air and Future Fuel Usage—Oil.** Grieve, T. R. Natural gas is a petroleum fuel and the mounting demand for energy is being increasingly met by petroleum-based fuels which have already made a major contribution to clean air. The author discusses the availability of oil in both the short and long term and discusses the end uses of this fuel. The major expansion in the use of oil in the U.K. has taken place in transport and industry, with a fourfold increase in transport since the war. Oil also plays an increasingly important part in domestic heating and in district heating. Although sulphur dioxide concentrations at ground level have dedecreased by about 20 per cent in the U.K. as a whole, the oil industry is not complacent and is carrying out research into the reduction of sulphur dioxide. With inland consumption of fuel oil of over 30 million tons, any requirement for further widespread desulphurization would involve a significant inflation of industrial costs to set against any indirect and longer-term gains in terms of living and working conditions. Oil has welcomed clean air legislation and is ready to co-operate in further advances in the standards of social amenity.

**1090. Clean Air and Future Fuel Usage.** Robens, Lord. The policy of the National Coal Board is to make available adequate supplies of solid smokeless fuel in order to give consumers the widest possible choice. The most notable success of recent years has been the solid fuel room-heater. The use of district heating is bound to grow, particularly for high-rise development. Clean air is closely connected with fuel policy. The output of coal at an economic cost should be maximized, and the economic basis on which this is assessed should take full account of all the social and balance of payments costs involved.

**1091. Some Factors in the Design of Chimneys.** Parker, A. The object of the paper is to explain certain factors in chimney design and the results of calculations, in a manner likely to be of service to public health inspectors and others who have the task of dealing with problems of mitigation of air pollution. The author deals particularly with design factors to ensure so far as practicable, a sufficient velocity of the gases leaving the tops of chimneys to avoid downwash by suction on the lee side of the chimney under most meteorological conditions in this country and to avoid the temperature in any part of the chimney falling to the acid dew point and causing the emission of acid particles, including acid smuts.

**1092. The Determination of Chimney Heights.** Scorer, R. S. The much tried procedure of determining chimney heights by means of a formula which gives some aspect of the ground-level concentration of effluent in combination with some supposed maximum acceptable concentration is shown to be unsound. In particular the concept of "thermal rise" is untenable.

The most effective way to control pollution within the bounds of reasonable cost is to ensure a continuous up-grading of standards from present practice, and this is done with a knowledge of what has been typically installed recently and whether it was acceptable.

Some local peculiarities are of such great importance that a study of them needs to be made before plans for new pollution sources, whether industrial or domestic, are accepted.

Studies of local pollution behaviour do not need sophisticated instruments but rather an alert awareness of what might happen, and they can be a most absorbing occupation.

**1093. Chimneys—The Aesthetic Factor.** Spawforth, P. D. The paper examines the problems of successful aesthetic integration of chimneys within the framework of the various physical elements comprising the town.

Following a look at the historical development of chimneys attention is given in turn to residential areas, large suburban buildings, town centres and industrial areas. In each category special concern is expressed at the effect on the environment of the unsympathetic integration of chimneys which are added to existing buildings. In the field of home heating it is the package deal; in shopping areas the laundrettes; in industrial and central areas the hasty erection of an additional chimney designed without professional aesthetic consideration which can destroy the mature harmony of the scene.

The acceleration of central area redevelopment offering both challenge and opportunity is examined and illustrated. Comment is made on the various spring cleaning operations for deteriorating areas which if co-ordinated with positive design policies for minor alterations can transform the urban environment in the 'next decade. With care and a greater aesthetic awareness by all concerned in the building processes this change will be for the better.

**1094. Progress at Scheduled Works.** Ireland, F. E. The paper is essentially a summary of selected sections of recent Annual Reports on Alkali, etc. Works by the Chief Inspectors. A statistical analysis has been made of remedies applied in different industries in dealing with their air pollution problems. The inspectorate does not judge industrial plants by the measures they have taken, but on the degree of success they achieve in practice. An attempt has been made to present both facets. There is no finality about the "best practicable means" requirement of the Alkali Act. It is a serial story which requires those who are interested in the subject to study Annual Reports. The whole field of inspectorate could not possibly be covered in this paper and the subjects covered are either indicative of the inspectorate's normal work or are of special current interest.

**1095. Black Areas and the National Survey of Smoke and Sulphur Dioxide.** Clifton, M., Grimoldby, M. R. and Sharp, A. J. By examining the most highly polluted sites in the records of the National Survey of Smoke and Sulphur Dioxide for the six winters from October 1961 to March 1967, the following subjects were investigated; the range covered by these figures in successive winters; their distribution between regions and between types of district surrounding the sampling sites; and the extent to which Black Areas contributed to the various indices of high pollution. The Black Areas were found to predominate, whatever index was used, but there was wide variation in the pattern from one region to another, and this differed as between smoke and sulphur dioxide pollution, so that the term clearly implies something very different in different parts of the country.

**1096. Routine Dust Measurement Methods Developed at C.E.R.L.** Lucas, D. H. and and Snowsill, W. L. Dust measurements methods have been developed at C.E.R.L., which have particular application to power stations but are also relevant to industrial plant.

A dust gauge which collects dust at all wind speeds and has a directional characteristic can be used for routine measurement in the field.

A recording dust monitor has been developed, used operationally and subsequently redesigned in a simplified form to monitor dust emission. The instrument applies an increasing emphasis as the dust diameter rises from 20 m to 100 m.

Improvements of smoke meters have been tested and a method of converting smoke density readings into Ringelmann number is proposed.

Both dust monitors and smoke meters are needed for the adequate monitoring of particulate matter over the range of particle sizes encountered in practice.

**1097. The Monitoring Work of the C.E.G.B. with Special Reference to Techniques and Instrumentation. The Measurement of Sulphur Dioxide.** Barber, F. R., Cummings, W. G. and Kingham, E. G. Improvements in the techniques of measuring sulphur dioxide in the atmosphere are described and the instrument modifications found necessary during 12 years' experience of survey work are explained. Details are also given of the recently-applied technique of direct data logging without intermediate chart records and the instrument installations being used for current survey and experiments.

**1098. The Influence of Traffic on Atmospheric Pollution. The High Street—Warwick.** Bullock, J. and Lewis, W. M. High Street/Jury Street, the main thoroughfare of the County Town Warwick, carried an abnormally large volume of through traffic including a large percentage of diesel vehicles. In anticipation of the completion of a relief road in 1967 an investigation into the effect of such traffic, on the atmosphere of the main street, was made between March 1965 and February 1966. This investigation revealed that pollution from smoke was five times greater than that experienced in the normal Borough atmosphere, the sulphur dioxide was greater by a factor of two and the lead values in this atmosphere, in mid-summer, were greater by a factor of six compared with the normal Borough atmosphere.

Immediately following the opening of the relief road round the town, in August 1967, the exercise was continued, assessing the three parameters mentioned above, and this paper sets forth such findings between September 1967 and May 1968 inclusive.

In addition, dust samples, collected monthly from a window ledge in the main street, were analyzed for lead content in the latest exercise and the concentrations on average appears slightly in excess of 0·5 per cent.

To the Authority the latest results must be extremely encouraging for they reveal a reduction in smoke by some 42 per cent of its previous value, sulphur dioxide now exceeds the Borough atmosphere by a factor of 1·4 only compared with 2·0 and lead contamination has been reduced by some 26 per cent of its previous concentration.

The results for lead throughout the week are biased about the values 2·2–2·8 microgrammes per cubic metre air and no less than 75 per cent of the present results are for values less than 3·2 microgrammes compared with 41 per cent in the initial survey.

Smoke values are similarly biased between the values 107 and 165 microgrammes and 73 per cent of weekly results are for values less than 197 microgrammes per cubic metre air compared with 26 per cent in the first survey.

**1099. Progress Towards the Abatement of Pollution from Petrol Vehicles in Britain.** Fosberry, R. A. C. Although the paper by title is concerned with abatement of pollution in Britain it will be readily appreciated that it cannot be confined to events in Britain since progress towards abatement here is very much influenced by events in America and Europe. This influence comes from the enormous technical effort in the U.S. and the recognition that the motor industry is an international industry and that regulations to control vehicle performance must likewise be international if any economic sense is to be preserved.

This paper will, therefore, consider the broad picture but will give additional details of the achievements of British manufacturers and the implications for emission control in the U.K. and Europe.

**1100. Clean Air and Electric Vehicles.** Barak, M. Battery-operated vehicles are fumeless, silent-running and their widespread use would restore the amenities. Unfortunately, however, the energy and power densities of the only practical battery systems so far developed are very much below the standards accepted for ordinary motor vehicles. Nevertheless, battery electrics have an increasingly important part to play in the transport and handling of goods and people and the paper describes some of these developments and the problems involved. The author indicates the advantages of electric traction, gives a summary of cost comparisons and looks at the attitude of other countries to the use of electric vehicles.

**1101. Practical Problems in the Approach to Smoke Control.** Harris, J. The sense of urgency and drive is lacking in our Smoke Control Programme. Why? The public are not having their attention directed to the necessity or its virtues. Clean Air is our birthright—a first priority in any scheme to provide environmental improvement. We have been given a mandate in the Clean Air Act, therefore, all of us who are interested act now.

# SMOKE CONTROL AREAS

## Progress Report

### Position at 30 September 1968—TOTALS

| | England | Wales | Scotland | Northern Ireland |
|---|---|---|---|---|
| **Smokeless Zones** (Local Acts) in Operation | 44 | — | 1 | — |
| *Acres*, 3,400 | | | | |
| *Premises*, 41,060 | | | | |
| **Smoke Control Areas in Operation** | 2,621 | 6 | 113 | 3 |
| *Acres* | 657,274 | 418 | 49,183 | 439 |
| *Premises* | 3,477,049 | 2,352 | 292,194 | 3,845 |
| **Smoke Control Orders** | | | | |
| *Confirmed* | 214 | 1 | 13 | 10 |
| *Submitted* | 67 | — | 5 | 1 |
| **Grand Totals** | 2,946 | 7 | 132 | 14 |

### Smoke Control Position in Regions of England at 30 September 1968

*(Figures supplied by Ministry of Housing and Local Government*

| (1) *Region* | (2) *No. of black area acres covered by smoke control orders confirmed or awaiting decision* | (3) *Percentage* of total black area acreage in region so covered* | (4) *No. of black area premises covered by smoke control orders confirmed or awaiting decision* | (5) *Percentage* of total black area premises in the region* |
|---|---|---|---|---|
| Northern | 25,010 | 19·96 | 123,443 | 22·32 |
| Yorkshire and Humberside | 145,090 | 38·53 | 488,815 | 41·85 |
| East Midlands | 47,528 | 17·72 | 146,848 | 28·69 |
| Greater London | 207,063 | 63·32 | 1,851,960 | 70·16 |
| North Western | 146,205 | 36·44 | 666,191 | 39·12 |
| West Midlands | 73,503 | 29·52 | 325,392 | 30·95 |
| South Western | 7,201 | 27·33 | 26,650 | 17·89 |
| Total (black areas) | 651,600 | 36·73 | 3,629,299 | 46·68 |
| Outside black areas | 115,095 | | 393,337 | |
| GRAND TOTALS | 766,695 | | 4,022,636 | |

* The percentage shown in columns (3) and (5) above are percentages of the *total* acreage and of the *total* number of premises in the black areas concerned. In practice it may not always be necessary for the whole of the black area authority's district to be covered by smoke control orders (e.g. there may be some areas of open country).

NOTE.—Statistics in respect of Wales and Monmouthshire are no longer included.

# NEW SMOKE CONTROL ORDERS

*The lists below are supplementary to the information in the last issue of* Smokeless Air (*Autumn 1968*) *which gave the position up to 30 June 1968. They now show changes and additions up to 30 September 1968.*

*Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.*

*The list of new areas in operation of smoke control is based on the plans submitted to the Ministry of Housing but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.*

## ENGLAND

## NEW SMOKE CONTROL ORDERS IN OPERATION

### Northern

*Tyneside and Wearside*

Boldon U.D. Nos. 4 and 5. Gateshead C.B. Nos. 10 and 11. Hebburn U.D. Nos. 8–10. Tynemouth C.B. No. 7.

*Teeside*

Hartlepool (West Hartlepool C.B. No. 5).

†Stockton on Tees B. (Hartburn No. 1).

† This authority forms a part of the new *Teeside C.B.*

### Yorkshire

*West Riding (North)*

Aireborough U.D. No. 22. *Bradford C.B. (West Bowling). Elland U.D. (Greetland No. 2). Horbury U.D. No. 5. Horsforth U.D. No. 25. Huddersfield C.B. (Longwood-Gledholt). Leeds C.B. No. 66. Morley B. Nos. 29, 34 and 35. Ossett B. No. 10; Pudsey B. No. 6. Rothwell U.D. No. 11. Wakefield C.B. (Horbury Road No. 1). Wakefield C.B. (Thornes Lane No. 1).

*West Riding (South)*

Darton U.D. Nos. 3, 10, 11 and 12. Rotherham C.B. (Kimberworth No. 1). Rotherham C.B. (Herringthorpe No. 4). Sheffield C.B. No. 4.

### North Western

*South Lancashire and North-East Cheshire.*

Ashton under Lyne B. No. 8. Bolton C.B. (Top o' the Moss). Bolton C.B. (Ladybridge). *Bury C.B. No. 6. Chadderton U.D. No. 8. Cheadle and Gatley U.D. Nos. 9A and 9B. Crompton U.D. No. 4. Denton U.D. No. 12. Droylesden U.D. No. 12. Dukinfield B. Nos. 12 and 14. Eccles B. No. 8A. Farnworth B. Nos. 2 and 3. Heywood B. No. 8. Hyde B. No. 5. Leigh B. No. 7. Manchester C.B. (Burnage). Middleton B. (Hollins Lane No. 11). Middleton B. (Whittle Lane No. 12). Middleton B. (Rhodes Green No. 13). Middleton B. (Top of Middleton No. 14). *Oldham C.B. No. 10. Prestwich B. No. 7B. Sale B. No. 8. Salford C.B. No. 12. Stalybridge B. (Mottram Road and Old Mottram Road). Stretford B. No. 11. Swinton and Pendlebury B. No. 5. Whitefield U.D. No. 8. Wigan C.B. No. 4.

*Central Lancashire*

Barrowford U.D. No. 1. Blackburn C.B. No. 7. Brierfield U.D. No. 2. Burnley C.B. No. 9. Darwen B. No. 3. Nelson B. No. 3. Padiham U.D. No. 8.

*Merseyside*

Bebington B. No. 11. Birkenhead C.B. No. 6. Liverpool C.B. Nos. 23, 25 and 26. Widnes B. No. 7.

### Midlands

*Derby, Nottingham and Chesterfield*

Alfreton U.D. No. 1. Chesterfield R.D. No. 8. Dronfield U.D. No. 3. Kirkby-in-Ashfield U.D. Nos. 1–4. Long Eaton U.D. (Wimpey's Estate No. 1). Long Eaton U.D. (Lower Brook Street No. 1). *Mansfield B. No. 4. Staveley U.D. No. 1. * Sutton-in-Ashfield U.D. No. 3.

*West Midlands*

Aldridge-Brownhills U.D. Nos. 27 and 27A. Birmingham C.B. Nos. 125 and 144. *Coventry C.B. No. 9. Dudley C.B. (Brierley Hill Nos. 27 and 28). Halesowen B. No. 28. Solihull C.B. Nos. 14 and 15. Stourbridge B. No. 25. Sutton Coldfield B. No. 10. Walsall C.B. No. 11. Wolverhampton C.B. No. 10B.

*Potteries*

Kidsgrove U.D. (Spout Hollow No. 2). Kidsgrove U.D. (Gillbank No. 2). Newcastle-under-Lyne B. No. 7. Stoke-on-Trent C.B. Nos. 17–20.

### London

*Greater London Boroughs*

Barnet L.B. No. 6. Brent L.B. No. 5. Croydon L.B. No. 9. Ealing L.B. Nos. 32–

34. Enfield L.B. No. 15. Harrow L.B. Nos. 14 and 15. Hillingdon L.B. No. 9. *Lewisham L.B. No. 24. Tower Hamlets L.B. Nos. 3 and 4. Waltham Forest L.B. No. 12. Westminster (City) L.B. (Queen's Park). Westminster (City) L.B. (Maida Vale North).

**Local Authorities Outside the Black Areas**

Blaby R.D. (Glen Parva No. 4). Chatham B. No. 5. Darlington R.D. (Newton Aycliffe No. 3). Glossop B. Nos. 1 and 2. Hale U.D. No. 1. High Wycombe B. No. 15. King's Lynn B. (Fairstead). Luton C.B. No. 6. *Ramsbottom U.D. No. 1. Reading C.B. No. 11. Rugby B. No 7 Skipton U.D. No. 5. Thurrock U.D. No. 5. Todmorden B. No. 6. Waltham Holy Cross U.D. Nos. 2–4.

## NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

**Northern**

*Tyneside and Wearside*

Longbenton U.D. No. 2.

*Teeside*

Hartlepool C.B. Nos. 13 and 14.

**Yorkshire**

*West Riding (North)*

Bingley U.D. No. 15. Elland U.D. (Stainland No. 3). Elland U.D. (Holywell Green). Halifax C.B. No. 15. Horsforth U.D. No. 27.

*West Riding (South)*

Barnsley C.B. Nos. 6 and 7. Rotherham C.B. (Herringthorpe No. 5). Rotherham C.B. (Greasbrough No. 2). Rotherham C.B. (Broom Lane No. 2).

**North Western**

*South Lancashire and North-East Cheshire*

Altrincham B. No. 7. Bury C.B. No. 7. Tyldesley U.D. No. 2. Westhoughton U.D. No. 4. Wigan C.B. No. 5.

*Central Lancashire*

Burnley B. No. 10. Padiham U.D. No. 9.

*Merseyside*

Bebington B. No. 12. Huyton with Roby U.D. No. 5.

**Midlands**

*Derby, Nottingham and Chesterfield*

Arnold U.D. No. 2. Carlton U.D. Nos. 3 and 4. Sutton-in-Ashfield U.D. No. 4.

*West Midlands*

Birmingham C.B. Nos. 152–155. Dudley C.B. Nos. 52–54. Sutton Coldfield B. Nos. 11 and 12.

*Potteries*

Stoke on Trent C.B. No. 22.

**London**

*Greater London Boroughs*

Bexley L.B. No. 9. Ealing L.B. Nos. 38 and 39. Harrow L.B. No. 17. Islington L.B. Nos. 28 and 29. Lambeth L.B. No. 21. Merton L.B. No. 11. Waltham Forest L.B. No. 14.

**Local Authorities Outside the Black Areas**

Cheshunt U.D. No. 5. Crawley U.D. (Northgate). Meriden R.D. No. 3. Norwich C.B. No. 1. Reading C.B. No. 12. Ripley U.D. No. 1. *Tamworth B. No. 2. Todmorden B. No. 7. *Warrington R.D. No. 1. Warrington R.D. No. 2. Whiston R.D. No. 2.

## SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

**Northern**

*Tyneside and Wearside*

Boldon U.D. Nos. 8–12. Gateshead C.B. No. 12. South Shields C.B. No. 3.

*Teeside*

Teeside C.B. No. 1.

**Yorkshire**

*West Riding (North)*

Dewsbury C.B. (Central Area). Huddersfield C.B. (Lindley-Birchencliffe). Leeds C.B. No. 73. Pudsey B. No. 7.

*West Riding (South)*

Swinton U.D. No. 13.

**North Western**

*South Lancashire and North-East Cheshire*

Bolton C.B. (Ladybridge No. 2). Bolton C.B. (Morris Green). Denton U.D. No. 10. Dukinfield B. No. 13. Horwich U.D. No. 1. Hyde B. No. 6.

*Central Lancashire*

Blackburn C.B. No. 9. Nelson B. No. 4.

*Merseyside*

Bootle C.B. (Sefton Estate). Bootle C.B. No. 9.

**Midlands**

*Derby, Nottingham and Chesterfield*

Derby C.B. Alvaston Nos. 15 and 16. Derby C.B. No. 17.

*West Midlands*

Aldridge-Brownhills U.D. Nos. 28 and 29. Warley C.B. Nos. 1–3.

**London**

*Greater London Boroughs*

Barnet L.B. No. 8. Ealing L.B. No. 40. Greenwich L.B. (West). Harrow L.B. No. 18. Kensington L.B. St. Charles No. 1.

**Local Authorities Outside the Black Areas**

Bedford B. Nos. 5 and 6. Canterbury C.B. Nos. 1 and 2. Corby U.D. No. 2. Darlington R.D. No. 4. Exeter C.B. (Pinhoe No. 1). Exeter C.B. (St. Thomas' No. 2). Hazel Grove and Bramhall U.D. No. 4. Hemel Hempstead (Chaulden No. 2). Ramsbottom U.D. No. 2. Swadlincote U.D. No. 1. Thurrock U.D. No. 6. Watford B. No. 8. Whitley Bay B. No. 5.

## SCOTLAND

### NEW SMOKE CONTROL ORDERS IN OPERATION

Coatbridge (Greenhill). Coatbridge (Langloan). Denny and Dunipace Glasgow (Knightswood Nos. 1 and 2). Port Glasgow Nos. 2 and 3.

### NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Barrhead No. 3 (Waulkmill). Hamilton (Fairhill/Laighstonehall). Paisley (West End). Paisley (Williamsburgh).

### NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Coatbridge (Cliftonville). Renfrew No. 5.

## WALES

### NEW SMOKE CONTROL ORDER CONFIRMED BUT NOT YET IN OPERATION

Wrexham B C. No. 3.

## NORTHERN IRELAND

### NEW SMOKE CONTROL ORDER IN OPERATION

Holywood U.D. Nos. 1 and 2.

### NEW SMOKE CONTROL ORDER SUBMITTED BUT NOT YET CONFIRMED

Castlereagh R.D. No. 3.

## Killer Stoves

During the weekend of 5 and 6 October carbon monoxide fumes from domestic coal burning stoves killed 12 people and poisoned 100 more in Belgium. The Reuter Report giving this information did not state the location of this episode, but attached some measure of blame to foggy weather accruing at the time and said dirty chimneys had prevented fires from drawing properly.

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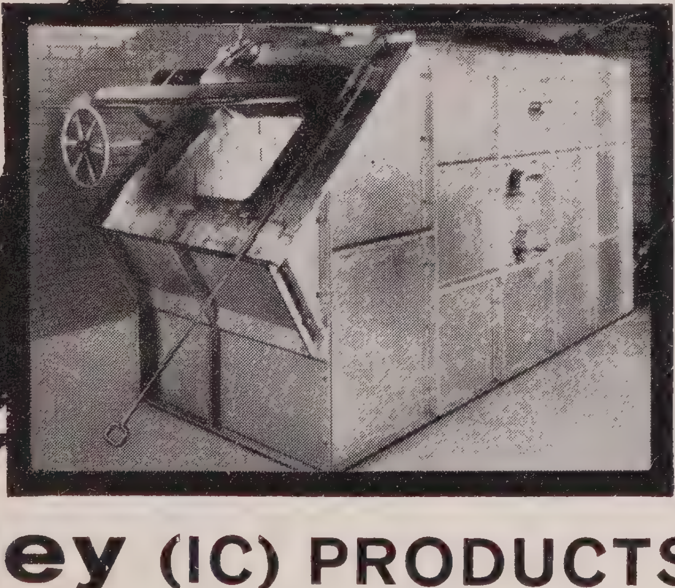

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IN 75

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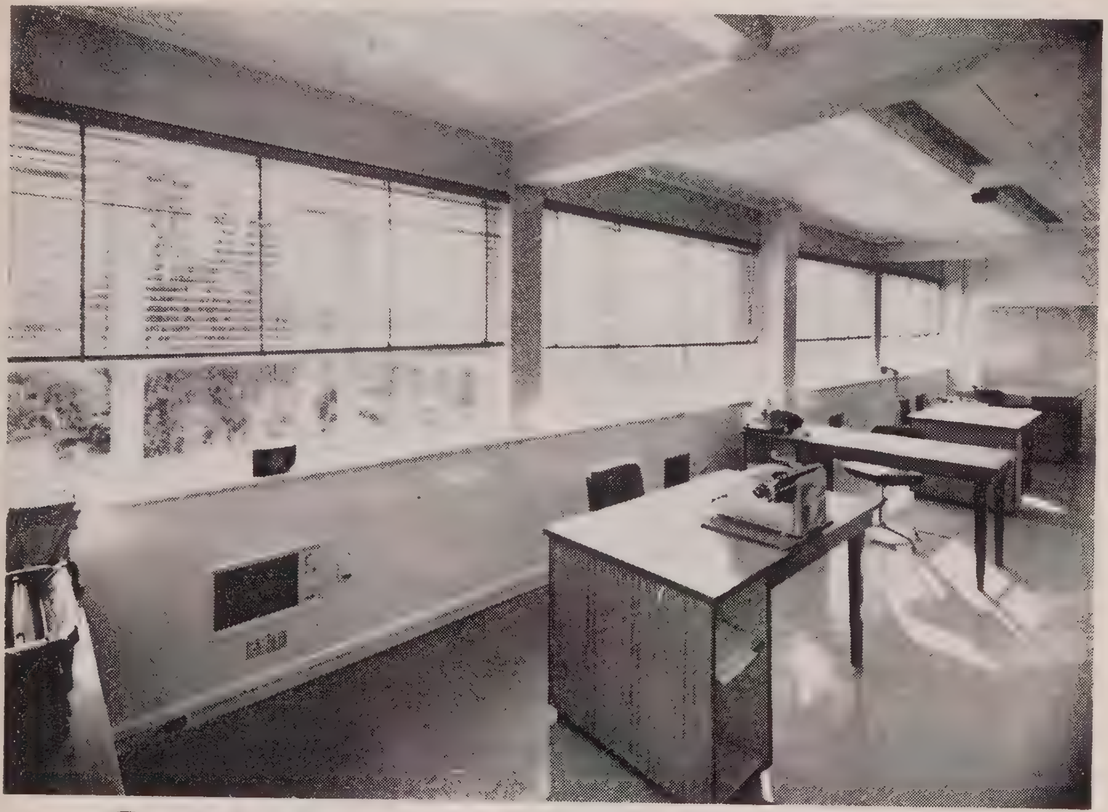
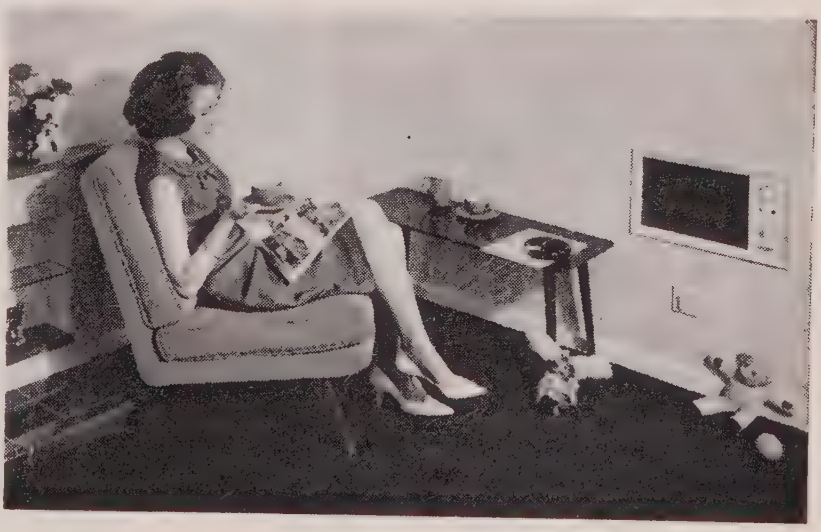
# HEATERS for the 70's

## for the MODERN HOME or OFFICE



buy sager

*Illustrations showing the MH4 in an office and in the home*



The Knightbridge range of heaters have been designed for incorporation within a normal building structure. Alternatively, installations for internal walls of breeze block structure require a surface mounted surround.

A modern range of bathroom, hall, and bedroom heaters.

PRICE RANGE FROM

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# VALUABLE FUEL for Clean Air Campaigns

**Local Authorities organising "Clean Air" campaigns, establishing Smoke Control Areas, organising House Improvement or Conversion schemes are invited to take full advantage of the services offered by the Solid Smokeless Fuels Federation, and available free of charge.**

## EXHIBITION

A complete pre-fabricated and self-contained "Clean Air" Exhibition: adaptable in size with one, two, three or four approved smokeless appliances under fire, and displays of the smokeless fuels available in the district.

## MOBILE UNITS

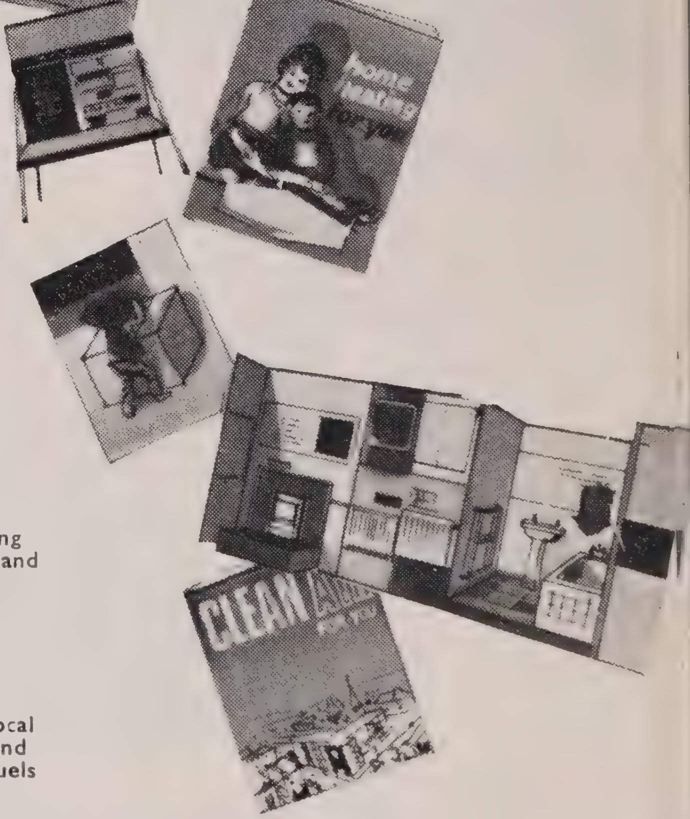
Manned with technical demonstrators, to advise and help residents in proposed or newly-formed Smoke Control Areas. They incorporate approved appliances under fire and a display of the solid smokeless fuels.

## DISPLAYS

A range of portable units variously displaying instructional panels dealing with Clean Air and the Act, a typical central heating unit, fuel displays and literature displays.

## LITERATURE

Informative literature is available free to Local Authorities explaining the Clean Air Act, and giving full information on solid smokeless fuels and the appliances.



*For full details of S.S.F.F. Services and literature apply to:*

**SOLID SMOKELESS FUELS FEDERATION**

**York House, Empire Way, Wembley, Middx.**

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*Printed by The Leagrave Press Ltd, Luton and London*

# Nottingham City Council saved £35,500 by installing the Baxi Fantom.

# What about your smokeless zone?

The Fantom is the cheering, eart-warming answer to the old facts of the Clean Air Act. Now, no one need give up a real ving open fire even in a mokeless zone. The Fantom as been designed in onjunction with the National oal Board.

The Fantom's secret is its uilt-in electric fan that reams air up through the uel, noiselessly, continuously, nd controllably. Switch on, nd all smokeless fuels burn rightly, to give a glowing, ving open fire.

They started installing 3,500 Fantom fires in the Bilborough, Beechdale, area of Nottingham early last year to be ready in time for the zone going smokeless in June, 1968. Installation was completed three months ahead of schedule. Because of the fact that the Fantom is so easy to install—literally only 2 screws are needed—fitters were putting in 11 or 12 fires a day. So Nottingham City Council saved even more money in labour time. Nottingham isn't the only 'Fantom Town'. Many others are also installing Fantoms.

**What a council gains:**
**Nearly £10 on every appliance**

With an average installed cost of only £15.0.0, the Fantom is easily £10 cheaper than any other domestic appliance designed and guaranteed to burn smokeless fuels brightly.

May we give you a demonstration?

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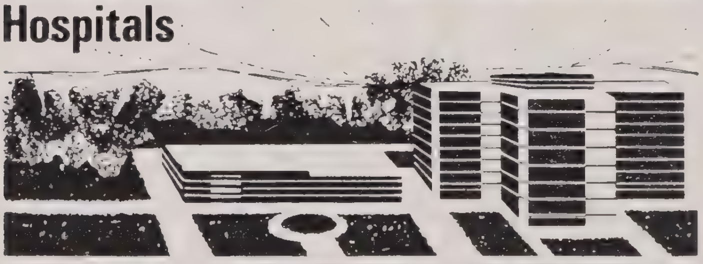

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REXCO is made from top grade coal—officially approved for use in Smokeless Zones. It's economical too—because it's long-burning and stores well. It's easy to light and to maintain.

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**It's Time to Change to Rexco — It's Smokeless**